


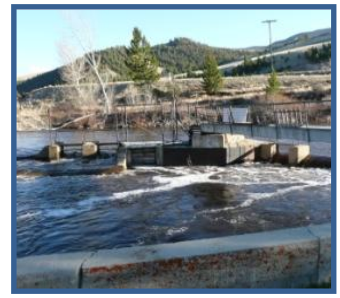

ENVIRONMENTAL ASSESSMENT

for the

Big Hole River Diversion Dam

in

Silver Bow and Beaverhead Counties, Montana

February 4, 2010

DOWL HKM

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Reviewed & Approved for Distribution:

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Abstract: The proposed project is a diversion dam replacement initiated by the City and County of Butte-Silver Bow. The Proposed Action is to replace the existing Big Hole River diversion dam and intake structure in order to provide a reliable source of potable water for the Butte service area. The Preferred Alternative provides a reliable diversion system, improves safety at the site for maintenance personnel and recreational users, and improves boat and fish passage.

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Supporting Technical Report

Water Master Plan, Robert Peccia & Associates (RPA), July 2008.

Copies of this report are available for review at the following locations:

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ABBREVIATIONS AND ACRONYMS

BLM........United States Bureau of Land Management
BRR........Biological Resources Report
BSB........City and County of Butte-Silver Bow
CFR........Code of Federal Regulations
cfs........cubic feet per second
CWA........Clean Water Act
DEQ........Montana Department of Environmental Quality
DNRC........Montana Department of Natural Resources and Conservation
EA........Environmental Assessment
EPA........United States Environmental Protection Agency
FEMA........Federal Emergency Management Agency
FWP........Montana Fish, Wildlife & Parks
FWS........United States Fish and Wildlife Service
HPC........Historic Preservation Commission
HUC........Hydrologic Unit Code
MCA........Montana Code Annotated
MDT........Montana Department of Transportation
MEPA........Montana Environmental Policy Act
MFISH........Montana Fisheries Information System
mgd........million gallons per day
MNHP........Montana Natural Heritage Program
MPDES........Montana Pollution Discharge Elimination System
NEPA........National Environmental Policy Act
NRCS........Natural Resources Conservation Service
NRDP........Natural Resource Damage Program
NRHP........National Register of Historic Places
NRIS........Natural Resource Information System
SHPO........State Historic Preservation Office
SPA........Stream Protection Act
SSURGO........Soil Survey Geographic
USACE........United States Army Corps of Engineers
U.S.C........United States Code
WMA........Wildlife Management Act

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1.0 Purpose and Need for the Proposed Action

1.1 Proposed Action

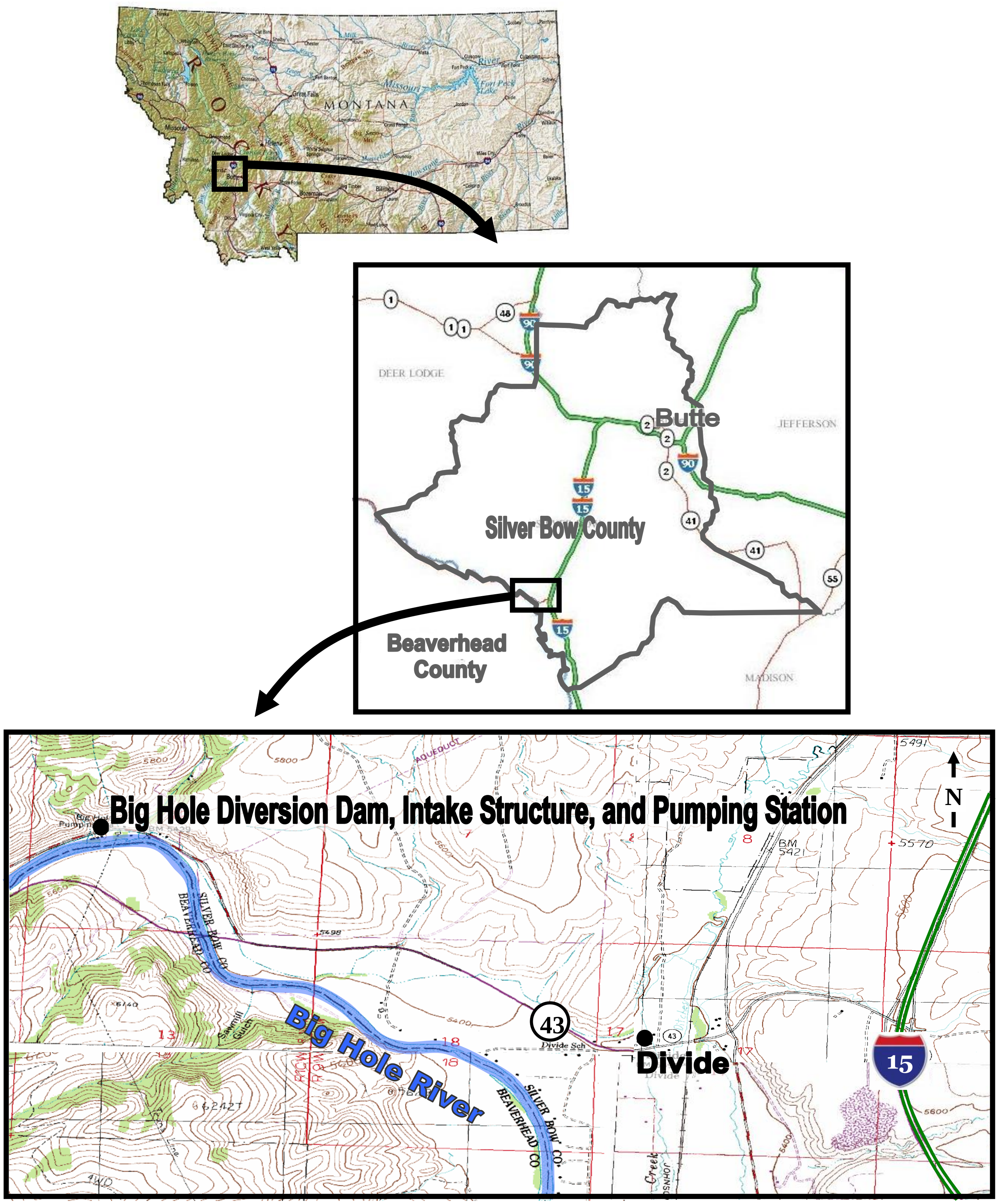
The proposed project is to replace the existing Big Hole River diversion dam and intake structure in order to provide a reliable source of potable water for the Butte service area. The facility is owned and managed by the City and County of Butte-Silver Bow (BSB) and is used to divert water from the Big Hole River to an adjacent pump station located on the river's north bank. The pump station lifts the water to a treatment plant located outside the project area approximately 10 miles to the northeast. Treated water is then piped another 11 miles northeast to storage and distribution systems in Butte, Montana. This system provides approximately 65 percent of the city's potable water.

Primary funding for this project is provided through a grant from the Natural Resource Damage Program (NRDP), with matching funds provided by BSB. Additionally, the U.S. Army Corps of Engineers (USACE) has committed to provide secondary funding for the environmental and design phases of the project.

1.2 Project Area Description

As illustrated in Figure 1-1, the proposed project is located in the Big Hole River on the border of Silver Bow and Beaverhead Counties near the community of Divide, Montana within Township 1S, Range 10W, Section 12.

Figure 1-1 Project Location Map



Note: Figure not to scale.

1.3 Purpose of the Proposed Action

The purpose of the proposed project is to provide a reliable source of drinking water for the Butte service area and to improve safety at the diversion dam site for maintenance personnel and public recreational use.

1.4 Need for the Proposed Action

The existing diversion dam and associated intake structure is approximately 80 years old and has outlived its useful life. Due to its age, the facility is in poor condition and poses an imminent threat of failure or malfunction. Loss of the diversion dam would deprive the citizens of Butte of potable water. Additionally, there are safety issues associated with maintenance and recreation at the site. These concerns are discussed in more detail below.

Existing Big Hole River Diversion Dam. DOWL HKM, 2009.

In 2008, BSB developed a Water Master Plan that evaluated the condition of various existing facilities in the Butte Water System. The Master Plan identified major deficiencies associated with the existing Big Hole diversion dam. Drawing from the Master Plan, the following sections describe in more detail the need for replacement of the existing facility.

Threat of Failure or Malfunction

The dam's downstream timber apron is failing, which has resulted in undercutting at the base of the dam. In recent years, emergency repairs have been required to abate this undercutting and prevent dam failure, and have included placement of large rocks below the dam to fill voids and to prevent further erosion of materials from under the dam. These repairs are considered temporary in nature and cannot be relied upon as a long-term strategy to prevent dam failure. A new scour hole was recently discovered under the dam that will require repair in the immediate future to prevent dam failure.

Deterioration of the Concrete Cap and Wall of the Settling Basin, facing southwest. HRA, 2009.

In addition to the timber apron, the concrete structure itself has severely deteriorated, including the abutment walls, settling basin, and intake structure. While these elements have been repaired several times, their strength has been compromised and they are in need of replacement.

The existing dam height and resulting water elevation is marginally sufficient to meet the suction head requirements of the vertical turbine pumps. A settlement or failure of the dam due to undercutting or further deterioration of the concrete structure would lead to a drop in water level, thereby preventing operation of the pumps and resulting in the loss of Butte's main source of potable water.

Apart from total failure of the diversion dam facility, winter conditions also threaten the flow of potable water to the Butte service area. Icing problems can obstruct the intake gates and intake structure. Ice must be removed by hand to prevent blockage that would result in interruption of flow to the Big Hole Water Treatment Plant and treated water consumers.

Safety Concerns

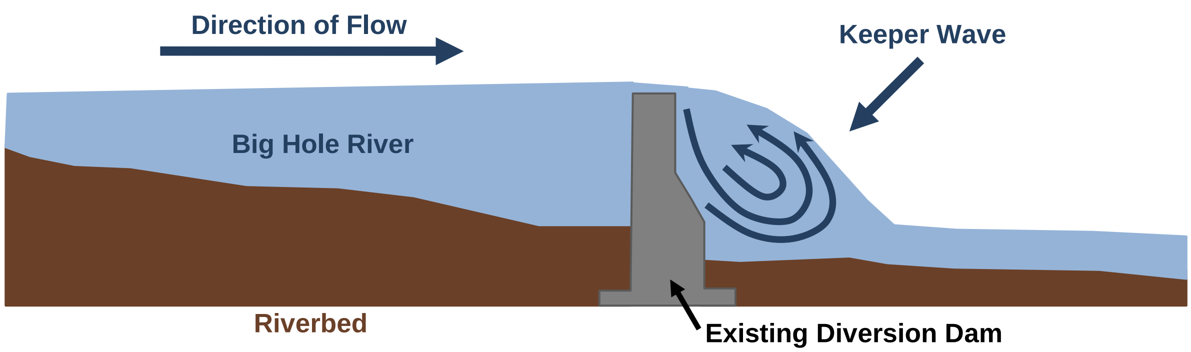
There are two main safety hazards associated with the operation and design of the existing dam structure. First, as noted above, the facility experiences icing problems in winter months. In order to remove blockages, BSB personnel often must venture onto the ice, placing themselves at risk of injury or drowning.

BSB Personnel Risk Injury at the Diversion Dam Site. DOWL HKM, 2009.

Secondly, the current configuration of the dam results in a turbulent area immediately downstream of the dam crest that is a life-threatening danger to boaters or recreationalists who might deliberately or inadvertently float or be swept over the dam. This turbulent area is generally referred to as a "keeper wave," and is illustrated conceptually in Figure 1-2. Based on anecdotal evidence, there have been a number of incidents at the diversion dam site in recent years involving boaters becoming trapped in this keeper wave and requiring external retrieval and rescue. This results in danger to both boaters and rescue personnel.

Warning Sign for Boaters. WHPacific, 2009.

Figure 1-2 Conceptual Illustration of Keeper Wave Downstream of Existing Diversion Dam



1.5 Project Goals, Screening Criteria, and Design Criteria

Project goals were developed to aid in the development and evaluation of proposed project alternatives. Through the Environmental Assessment (EA) scoping process, BSB gathered input from BSB operation and maintenance personnel, regulatory agencies, stakeholders, and members of the public to aid in establishing project goals. As noted in previous sections, the reliability of the water source and the potential for dam failure or malfunction are of primary concern. The Big Hole River must continue to serve as a source of potable water for Butte. BSB personnel have expressed concern regarding icing, debris and sediment loading, maintenance requirements, and safety issues. BSB, regulatory agencies, and members of the public are also concerned that the existing diversion dam serves as a check point for larger aquatic organisms; due to the facility's design, fish have difficulty passing the existing structure. Similarly, the existing structure presents challenges for safe boater passage. Regulatory agencies also voiced concern about environmental impacts that might result from the proposed project.

These concerns were considered in the development of the following Project Goals, which are not listed in order of importance.

- Goal 1: Provide a reliable source of potable water for the BSB service area
- Goal 2: Reduce maintenance requirements
- Goal 3: Reduce icing problems
- Goal 4: Improve fish passage
- Goal 5: Improve boat passage safety
- Goal 6: Minimize impacts to environmental resources
- Goal 7: Improve safety for maintenance personnel
- Goal 8: Minimize project costs

These project goals are used in Chapter 5 as Screening Criteria to aid in the evaluation of alternatives and selection of the Preferred Alternative.

2.0 Alternatives Development

2.1 No Action Alternative

Alternative 1: No Action

The Big Hole Diversion Dam was constructed in approximately 1927. The diversion dam consists of a concrete dam wall with a vertical upstream face, which is approximately five feet high and 10 feet wide at the bottom. The dam wall was constructed on top of an 18-inch-thick base slab with a 4-foot-deep cut-off wall on the upstream side. The downstream apron of the dam is approximately 12 feet wide and constructed of 12-foot-long by 6x6-inch timbers. The total length of the dam is approximately 190 feet. Depending upon water levels and river flow conditions, water can be diverted from the river at a multitude of locations, including the center channel raceway, the upstream weir, and a concrete pier located mid-river. As water is diverted from the river, it enters a concrete settling basin to allow for settlement and removal of debris and sediment before entering the concrete pier. From the concrete pier, water is conveyed via a 4-foot by 5-foot concrete pipe to a 20-foot-diameter concrete cistern located on the north bank of the river. Discharge piping from the cistern feeds a common suction header pipe with individual pipe branches to each of the vertical turbine pumps in the pump station building.

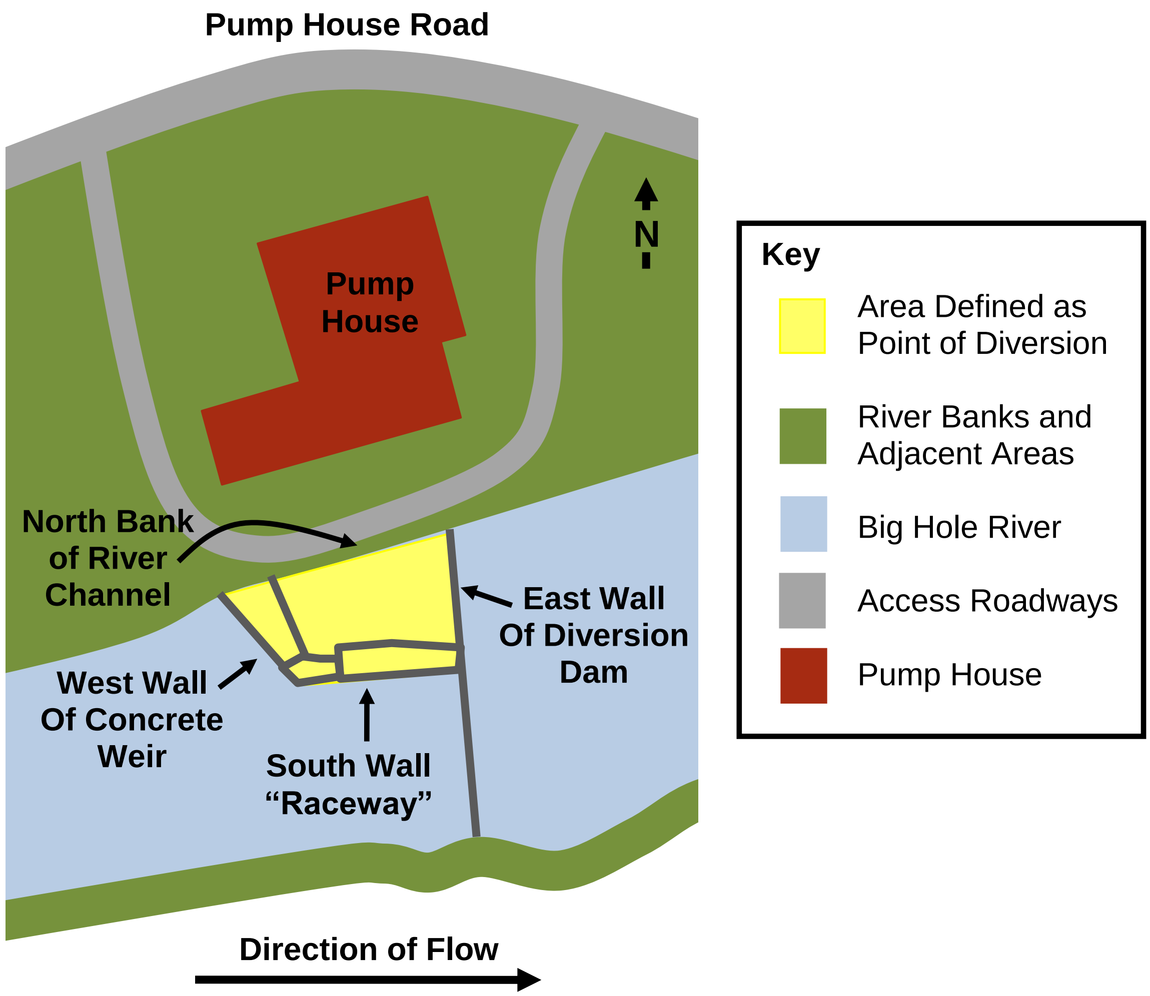
Alternative 1 would consist of leaving the facility in its current configuration and state of operation. Although routine maintenance would be provided, critical elements of the structure would continue to deteriorate over time. The high risk of failure or malfunction would remain, with the associated threat of interruption of potable water service to Butte. Further, there would be no improvement in safety for BSB personnel or for boaters at the site. Additionally, fish passage would continue to be impeded by the existing diversion dam.

The existing point of diversion would remain unchanged under this alternative, which would eliminate the need for a lengthy permitting process potentially involving the readjudication of BSB's existing water right. As noted previously, water is diverted from the Big Hole River at various locations within the existing diversion dam and intake configuration depending on the flows during a particular time of year. Accordingly, in consultation with the Montana Department of Natural Resources and Conservation (DNRC) Water Resources, the existing point of diversion has been defined as the footprint or area approximately 750 square feet in size bound by the following system components:

- The south wall of the existing concrete channel known as the "raceway"
- The west wall of the existing concrete upstream weir
- The north bank of the river channel
- The east wall of the existing diversion dam back to the intersection of the south wall of the raceway

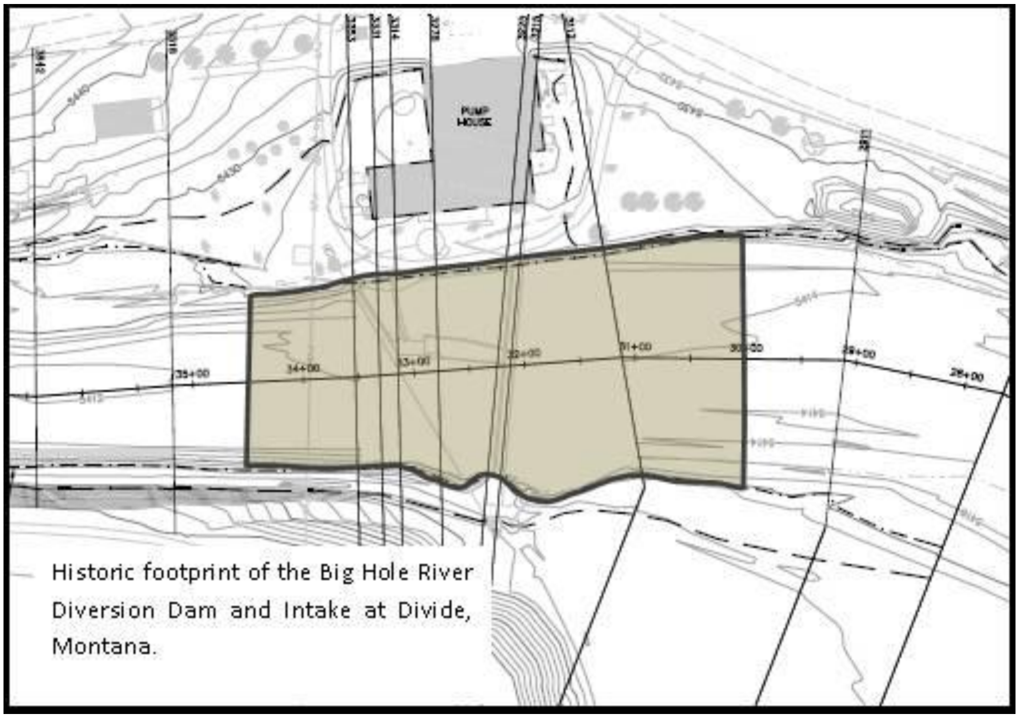
Figure 2-1 illustrates these system components and provides a reference figure for Alternative 1: No Action. A letter from DNRC Water Resources confirming this definition of the existing point of diversion is included in Appendix A.

Figure 2-1 Illustration of Alternative 1: No Action and Area Defined as Point of Diversion



For purposes of permitting through DNRC Trust Lands, the historic footprint has been defined more broadly to include the area of historic maintenance activities upstream and downstream of the diversion dam structure. This historic footprint is defined as an area approximately 400 feet in length by the width of the river comprising approximately 1.6 acres. More specifically, the area is defined as Station 30+50 downstream and 34+50 upstream and by the north and south banks of the river, as illustrated in Figure 2-2 (Appendix B contains a full description of the historic footprint).

Figure 2-2 Historic Footprint of Existing Diversion Dam Including Historic Maintenance



Source: DOWL HKM, 2009.

2.2 Proposed Action Alternatives

Through public involvement activities and interdisciplinary coordination with federal, state, and local officials and regulatory agencies, a number of alternatives were developed and analyzed for their operational benefits and impacts to the surrounding built and natural environment. A total of four Action Alternatives were considered for this project. These alternatives are described in more detail below. Preliminary design drawings illustrating these alternatives are included in Appendix C. A supporting Alternatives Analysis Report is included in Appendix D.

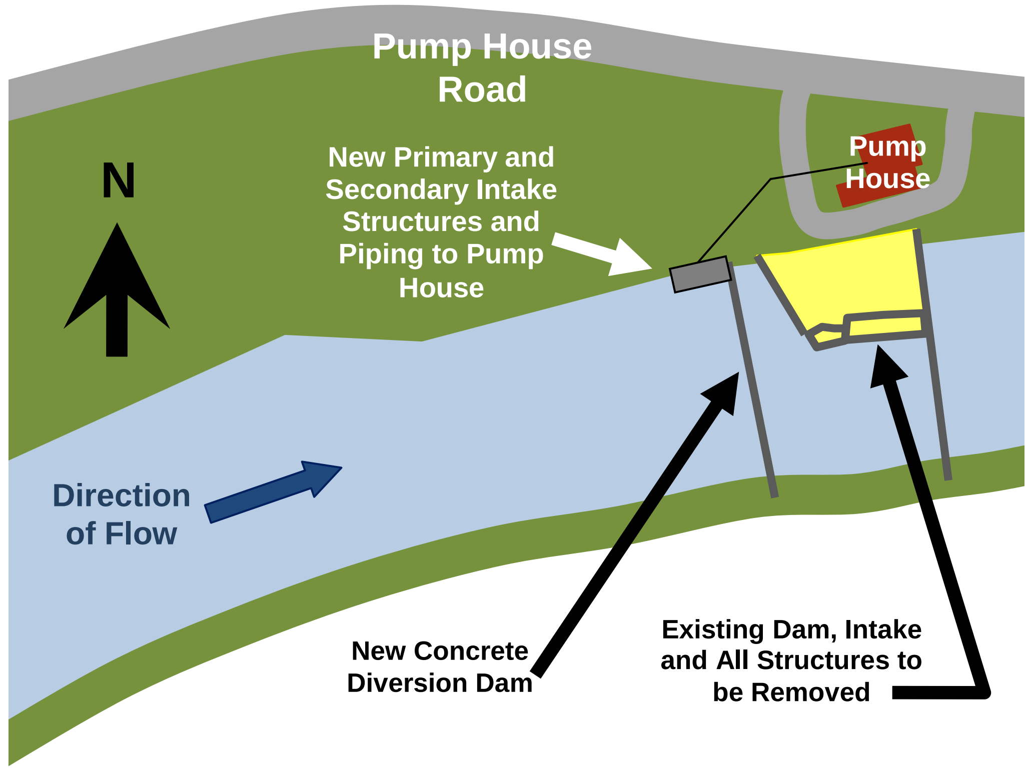
It should be noted that the Action Alternatives were designed to meet minimum functional requirements, including improved pump suction head, improved water diversion during periods of low flows, decreased sediment loading and improved trash removal, adequate design life, maximum and minimum water flow conveyance capabilities, and improved water diversion during periods of cold weather and icing. During the design process, the following Design Criteria were defined for each of the Action Alternatives.

- BSB's historical water right of 21.26 cubic feet per second (cfs) can be diverted at river flows at or above a defined low flow value of 200 cfs
- Boat passage is possible through the diversion dam at river flows at or above a defined value of 300 cfs; at lower flows, overland portage is required over certain portions of the river both up and downstream of the diversion dam
- For flows at or above the defined low flow value of 200 cfs, the minimum water surface elevation needed to provide sufficient hydraulic head is defined as 5,419 feet.

Alternative 2: Replace in Kind

Alternative 2 would replace the existing concrete diversion dam, intake structure, and intake piping with a new dam and intake system that would be nearly identical to the existing dam in location, alignment, and configuration. Figure 2-3 presents a graphical illustration of Alternative 2: Replace in Kind. Detailed drawings are presented in Appendix C.

Figure 2-3 Illustration of Alternative 2: Replace in Kind



Alternative 2 would include the removal and replacement of the existing concrete dam and all other associated components. The new concrete dam structure would be located just upstream of the existing dam to allow for continued operation of the existing system during construction activities, and would therefore require a permit for a new point of diversion through DNRC. The new in-stream dam would create a slightly higher water surface elevation upstream of the dam to improve existing pump performance.

The new concrete dam would be located at approximately Station 33+80 (see drawings provided in Appendix C). It would cross the river channel at nearly right angles and would be approximately 147 feet in length. The dam crest would be established at an elevation of 5,418.8 feet and would include a stepped dam face to eliminate the keeper wave that currently exists. An upstream grouted toe trench would be installed immediately upstream of the new dam face to preclude water from flowing beneath the dam and serve as a cutoff wall. The new dam would bear on a concrete footing placed below the river bed and would be monolithically connected to a downstream concrete apron and eventual native rock transition to the river bed. The dam would function by blocking the river flow and damming up the water level until it overtopped the dam crest. An upstream pool would be created with an approximate depth of five to six feet at the dam face. This upstream pool would provide an upstream water surface elevation of approximately 5,419 feet at all flows. This upstream water surface elevation would establish the amount of available head that could be used to convey water to the pumps through the position of a new intake and connector piping to be located on the north shoreline.

The existing diversion dam and intake structure includes a settling basin intended to provide a protected backwater area that would enable settling out of larger particles and debris such as pine cones, leaves and small gravels prior to the flow entering the piping and eventually the pump suction lines. Based on historical reviews of maintenance activities, the effectiveness of this system has been questioned and it was determined that a sedimentation basin is no longer necessary for the following reasons:

1. The water system has been altered substantially since the original dam and diversion structures were constructed; most notably, a water treatment plant was constructed in the 1990's that intercepts the raw water flow, and provides both chemical and physical treatment of the raw water before delivering to the water users. Historically, prior to this treatment facility, raw water was simply disinfected and delivered to the end users.

2. The proposed intake structures will be fitted with screens that are sized to preclude debris and trash from entering the system. Screen and screen materials have evolved substantially in terms of availability, materials of construction, and technological advancements since the original construction of the dam and intake structure, and are very efficient at sediment and debris removal in a river setting.

3. Historically, sediment loading levels in the river are the highest during runoff events, either snow melt or rain storms. This also coincides with the highest river flows. Under existing conditions, the river flows simply overtop the upstream weir and flood the existing settling basin, thereby rendering it ineffective for sediment removal. Although the settling basin is effective in removing sediment during period of lower flows, the need is minimal because the sediment loading levels in the river are much lower during these periods.

For these reasons, new piping would convey raw water directly from the intake to the existing pumps, no longer routing through a settling basin.

The existing intake system would be replaced by a new slotted intake screen at a new primary intake on the north bank. The intake structure would consist of a simple concrete chute located adjacent to the north shoreline and integral to the north abutment of the new concrete dam. The footprint of the concrete chute would be approximately 45 feet in length parallel to the river bank and 20 feet in width. The actual chute would be approximately 24 feet in length and six feet wide. The chute would be designed such that the floor of the channel would be located at an approximate elevation of 5,414 feet. Each side of the chute would be fitted with intake screens along the entire length that would enable water flow through the screens into a collection box which would then be piped north and east into the existing pump station building. The new piping would enter the west side of the existing pump station building, proceed along the north wall of the pump bay and connect to the existing suction header on the north side. The operation of the intake would rely upon the consistent control of the upstream water surface elevation.

This upstream water surface elevation would be maintained by a control valve located on the downstream end of the concrete chute. Allowing more or less water to pass through the chute would determine water flow over the dam crest and ultimately the upstream water surface elevation.

Figure 2-4 Depiction of a Fontaine Butterfly Channel Gate

Note: Valve is constructed of stainless steel and w mounted to the side and floor of the channel.

Two design options are being considered for the intake control valve: a butterfly channel gate valve and an Obermeyer gate valve

The butterfly channel gate valve would serve as a control valve to "check" or maintain the upstream water surface elevation. The butterfly valve would be located within the concrete chute in a vertical position; through use of an operator handwheel, the valve could be positioned by rotating the valve face from completely perpendicular to the river flow to completely parallel to the river flow. As the valve is opened, it would create maximum water flow velocity along the edges of the concrete chute upstream of the valve which would enable cleaning and flushing of the upstream intake screens. Figure 2-4 shows a typical butterfly channel gate valve. The main advantage of the butterfly valve is its ability to provide operational flexibility to enable maximum system performance during variable river flows, weather conditions, and raw water demands, while the main disadvantage is the possibility of ice collection and deposition during periods of extreme cold weather, although an aeration system could be installed to reduce ice formation.

Figure 2-5 Depiction of an Installed Obermeyer Gate System

Note: Big Hole River application would only span the width of the intake chute (approximately six feet).

A second intake control valve option would involve an Obermeyer gate valve, which is most simply described as a row of steel gate panels mounted in the floor of the intake chute and supported on their downstream side by inflatable air bladders. By controlling the pressure in the bladders, the pond elevation maintained by the gates can be adjusted within the system control range (full inflation to full deflation) and accurately maintained at user-selected set-points. When fully deflated, the flowline of the chute would allow unrestricted water passage past the intake screens; when fully inflated, the gate would rise to the dam crest level, creating an increase in the upstream water surface elevation. The gate elevation could be varied dependent upon instream flows such that adequate volume and velocity of water could pass through the intake chute to enable adequate diversion, clearing of screens, and passage of ice and debris over the top of the gate, yet could be adjusted to enable flows over the new dam. The position of the crest of the gate would control flow through both the intake channel and the main channel and also help to regulate the entire upstream water surface pool. Figure 2-5 shows a typical Obermeyer Gate installation. The main advantage of the Obermeyer Gate system is that it can be raised and lowered to efficiently pass flood flows, ice, and debris.

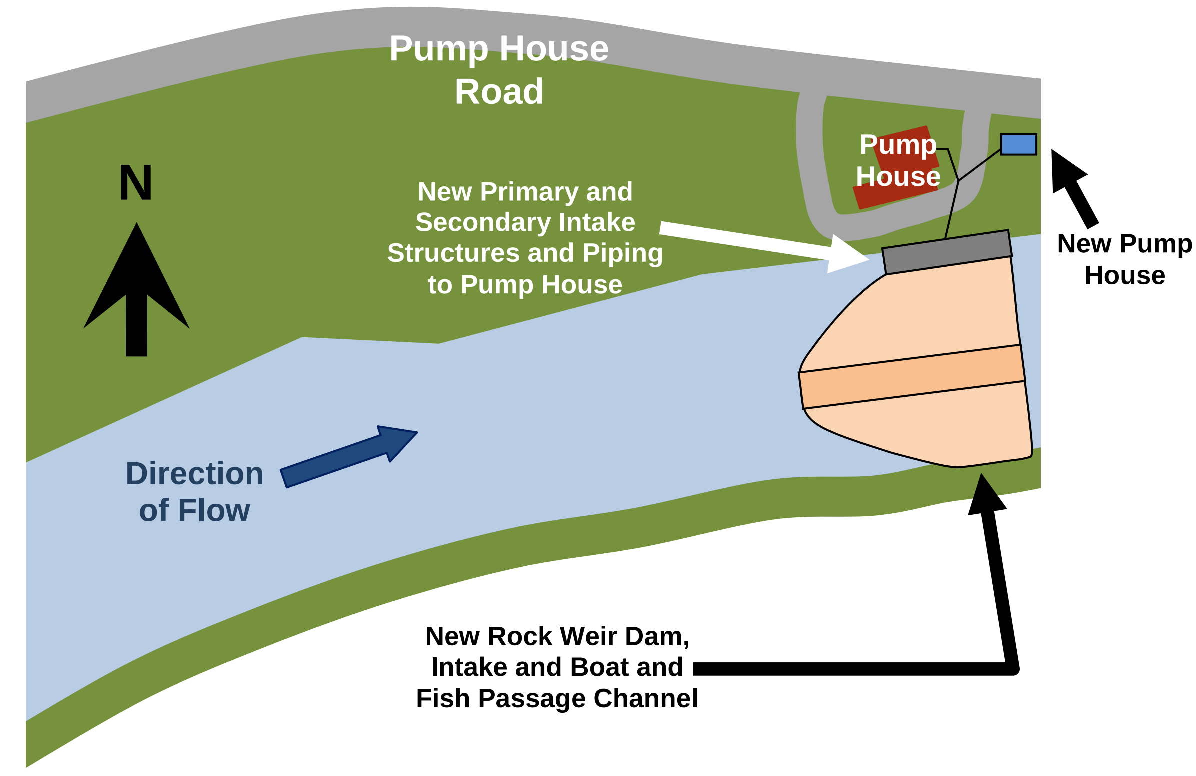
A floating boom would be installed immediately upstream of the intake chute to redirect floating debris from the intake. A secondary intake would also be installed as an integral part of the intake system to provide short-term water delivery pending repair measures in the event of primary intake failure.

This alternative would require a new penetration of the existing pump house, although the existing pump system configuration would be utilized to minimize impacts to the pump house. Upon completion of the new dam and intake system, all existing facilities, including the dam, settling basin, pier, raceway, weir, and cistern would be removed and the river channel would be restored to natural conditions. Alternative 2 would incorporate improved operational and safety features that would benefit maintenance personnel, but would not include boater or fish passage features.

Alternative 3: New Rock Weir Dam and Intake with New Pump House

Alternative 3 would involve complete removal of the existing diversion dam and associated components and installation of a new rock weir dam with a boat and fish passage channel located at the apex. Figure 2-6 presents a graphical illustration of Alternative 3: New Rock Weir Dam, Intake and Pump Station. Detailed drawings are included in Appendix C.

Figure 2-6 Illustration of Alternative 3: New Rock Weir Dam and Intake with New Pump House



Alternative 3 would be constructed in two phases. Phase I would remove the existing diversion dam and associated features, and replace it with a single concave rock weir located in approximately the same location as the existing diversion dam, thereby eliminating the need for a DNRC permit for a change in point of diversion.

As depicted in Figure 2-6, the new dam would be chevron shaped with the nose of the dam located upstream. The dam would function similarly to other dams in that it would serve as a flow impediment and thereby increase the upstream water surface profile. The new rock weir dam would extend from approximately Station 31+25 to Station 34+00 with the crest beginning at the existing dam's south bank abutment, extending upstream 150 feet to the nose of a chevron shape and then back to the existing dam's north bank abutment. The crest of the rock dam would be at elevation 5,420 feet with the upstream face gradually sloping to match the upstream river bottom elevation of 5,414 feet. The downstream face of the dam would also gradually slope to match the river invert elevation of 5,414 feet. The boat and fish passage channel would be located at approximately the river thalweg and would extend from dam crest downstream 250 feet. The spillway width would be designed to allow boaters to float through with oars extended; boaters would not experience any inconvenience while passing through the spillway. The profile of the new weir structure would include small downstream steps to gradually lose elevation down the rock face. The shape and elevation of the weir would be optimized to provide the desired upstream water surface and safe boating and fish passage. The rock weir would be visible during low flow conditions, while intake structures would remain relatively hidden from view at all times. The rock weir would be constructed of quarried rock or native round rock as opposed to concrete in order to minimize visual impacts. The rock would be grouted to form a natural channel. The grout would be placed such that at least six inches of the rock would be exposed to create an ideal environment for aquatic organisms.

The fish and boat passage channel would consist of a "notch" through the dam that would be trapezoidal in shape and would extend from the upstream water pool through the dam section and have a bottom section width of 27 feet and a top width of 73 feet. The passage channel would include two rest pools measuring approximately 40 feet in length parallel to the river flow and 50 to 75 feet in width perpendicular to the river flow. The slope of the chute of the section immediately downstream of the crest would be approximately 4.3 percent and approximately 6.7 percent for the section between the first and second rest pools. The channel and rest pools would all be constructed from native or quarried rock grouted to form a natural channel. The grout would be placed such that at least six inches of the rock is exposed to create an ideal environment for aquatic organisms.

The new dam would be constructed from grouted rock as well and would bear on a grouted rock keyway that would anchor the structure to the river bed. The dam would function by blocking the river flow and damming up the water level until it overtopped the boat and fish passage channel weir elevation. An upstream pool would be created with an approximate depth of five to six feet at the dam face. This upstream pool would provide an upstream water surface elevation of approximately 5,419 feet at all flows. This upstream water surface elevation would establish the amount of available head that could be used to convey water to the pumps through the position of a new intake and connector piping to be located on the north shoreline.

Phase I would also include construction of new primary and secondary intake systems and new transmission piping from the intake system to the existing pump station with provisions for connection to a new pump station in the future. The primary intake would be located along the existing north wall and would include screens for sediment removal. The new intake structure and functionality would be essentially identical as described under Alternative 2, but would be located within the footprint of the existing diversion dam. Similarly, the intake control valve would involve either a butterfly gate valve or an Obermeyer gate valve with the same benefits as noted in the prior discussion. The secondary intake would be located slightly upstream and would include coarser screens or bar screens to provide short-term water delivery pending repair measures in the event of primary intake failure. As described for Alternative 2, a floating boom would be installed immediately upstream of the intake chute to redirect floating debris from the intake.

During Phase I, the new diversion dam and system components would improve upon the existing available suction head on the existing pumps in the existing pump station. The new dam would create a minimum upstream water surface profile of 5,419 feet and, when coupled with a new intake and conveyance piping, would result in minimal head loss to the existing pump suction header. As a result, Alternative 3 would ensure that the available head to the existing pumps would be equal to or greater than what is currently available over the range of anticipated operational flows. The system would be designed with a "wye" leg such that piping could be extended to and penetrate the east side of the existing pump station building for Phase I operations, and be fitted to accommodate piping for Phase II. New piping would convey raw water directly from the intake to the existing pumps, no longer routing through a settling basin.

Phase II would involve construction of a new pump house located to the northeast of the existing pump house. New pumps, piping and controls would be a part of the new pump house. In 1995 and 1996, new pumps were installed in the existing pump house, however bedrock conditions were encountered during pump installation, preventing the pumps from being installed at the proper elevations to match with the available water surface elevation of the existing diversion dam and intake structure. As a result, pump cavitation currently occurs more frequently than desired. The new pump house facility would fully alleviate these conditions by providing a new wet well and matching the pump suction bowls to the available minimum upstream water surface elevation, thereby eliminating this concern. Under Phase II, all water delivery components would be removed from the existing pump station.

This EA will consider both Phase I and Phase II of Alternative 3, although the timing of Phase II is dependent on funding.

In analyzing Alternative 3, a river flow of 200 cfs was assumed to represent the mean average low flow required for intake function (Note: this intake function criteria should not be confused with the minimum boat passage criteria of 300 cfs, as referenced previously). By varying the flow through the intake chute, the relative volume ratio of water was determined between the intake chute and the boat and fish bypass channel. Table 2.1 illustrates this partition of flow for three conditions, as follows: 1) Fully unrestricted flow through the intake chute in which the butterfly gate valve is completely parallel to flow or the Obermeyer Gate is completely deflated; 2) Fully restricted flow through the intake chute in which the butterfly gate valve is completely perpendicular to the flow or the Obermeyer Gate is completely inflated; and 3) Partial restricted flow in which the butterfly valve is 50 percent open or the Obermeyer gate is 50 percent inflated.

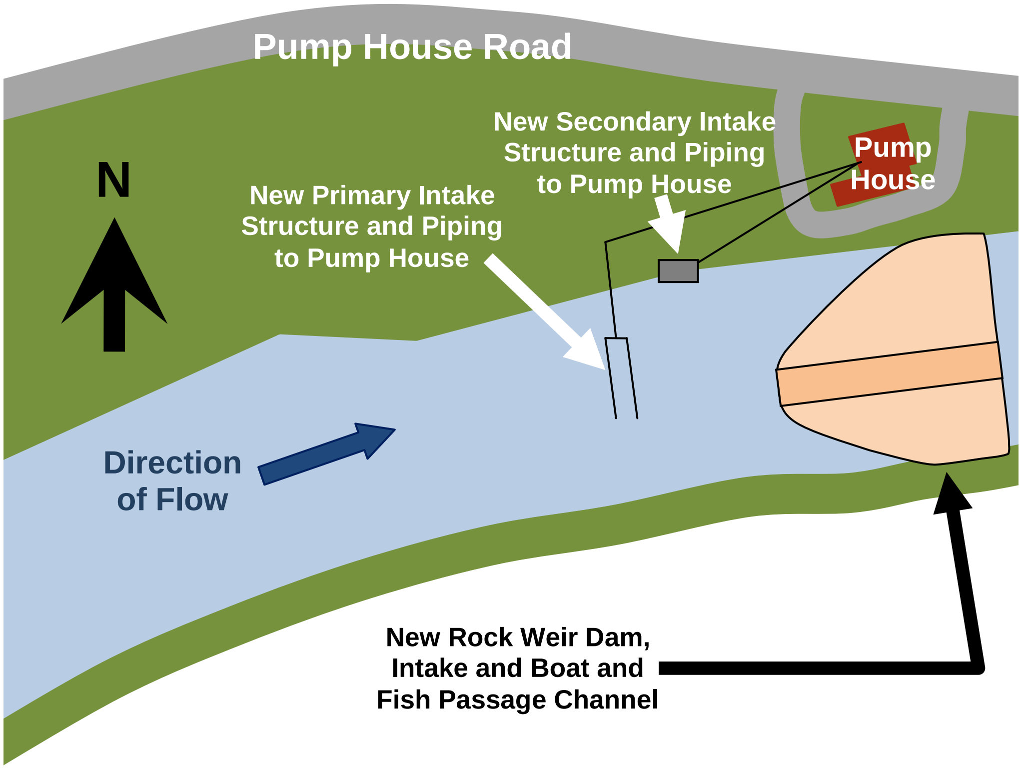
Table 2.1 Flow Volume Partitioning Through Intake Chute and Boat / Fish Bypass Channel for Alternative 3

Condition	Intake Chute Volume (cfs)	Boat / Fish Bypass Channel (cfs)
Fully Unrestricted Flow in Intake Chute	150	50
Fully Restricted Flow in Intake Chute	0	200
Partially Restricted Flow in Intake Chute	100	100

Alternative 4: New Rock Weir Dam with Floating Intake

Alternative 4 would involve removal of the existing concrete diversion dam and associated components and replacement with a new rock weir dam. Figure 2-7 presents a graphical illustration of Alternative 4: New Rock Weir Dam and Floating Intake. Detailed drawings are included in Appendix C.

Figure 2-7 Illustration of Alternative 4: New Rock Weir Dam with Floating Intake



As depicted in Figure 2-7, the rock weir dam would be nearly identical to the rock weir dam proposed under Alternative 3 with the same footprint, crest width and height, and materials of construction. As with Alternative 3, the rock weir dam would be located in approximately the same location as the existing diversion dam. The rock weir dam would include a notched spillway in the center, designed to facilitate boat and fish passage similar in size, length and arrangement as described in Alternative 3. The profile of the new weir structure would include small steps to gradually lose elevation down the rock face. By eliminating the single existing vertical drop of approximately five feet on the downstream side of the existing dam, the new weir would improve boater passage and safety. As with Alternative 3, the rock weir would not look or function like a traditional concrete dam. It would be visible during low flow conditions, while the intake structures would be relatively hidden from view. During larger flow events, however, the weir would become fully submerged. The structure would be designed to mimic native conditions and would be constructed with quarried rock or native round rock, which would be grouted together to provide connectivity and mass. The grout would be placed such that at least six inches of the rock would be exposed to create an ideal environment for aquatic organisms.

Under Alternative 4, new primary and secondary intake facilities would be located upstream of the existing dam, thereby taking advantage of the natural stream gradient which provides upstream elevation gains. This design would increase pump suction head and improve pump performance. The primary intake would consist of buried piping extending outward from the north river bank into the river. The pipes would be anchored at a point partway into the river in order to prevent movement up or downriver. From this anchor point, the buried piping would extend further into the river, eventually extending out of the river bed and connecting to a screened end pieces, called “River Tee screens.” The end piece would be bolted to a sled, allowing the intake to “float” or rest on the river bottom. The primary intake would be placed in the natural pool upstream of the existing diversion dam, allowing it to be completely submerged under all flow conditions. Because the intake would be moved upstream, a DNRC permit for a new point of diversion would be required. As with Alternative 3, this alternative would entail removal of the existing settling basin, with raw water conveyed directly from the intake to the west wall of the existing pump house via new piping. In addition, a secondary intake would be located approximately 50 feet upstream of the new dam face on the north river bank. This secondary intake would consist of a concrete collection box covered with a bar screen that would convey water via buried pipe to connect to the primary intake piping alignment, and would only be used for emergency purposes in the event of failure or regular maintenance of the primary intake.

In analyzing Alternative 4, a river flow of 200 cfs was assumed to represent the mean average low flow required for intake function. Since the new intake structure would be located upstream of the new dam and flow would not be regulated through an intake chute, all river flow would pass through the boat and fish passage channel, as shown in Table 2.2.

Table 2.2 Flow Volume in Boat / Fish Bypass Channel for Alternative 4

Condition	Intake Chute Volume (cfs)	Boat / Fish Bypass Channel (cfs)
Unrestricted Flow	NA*	200

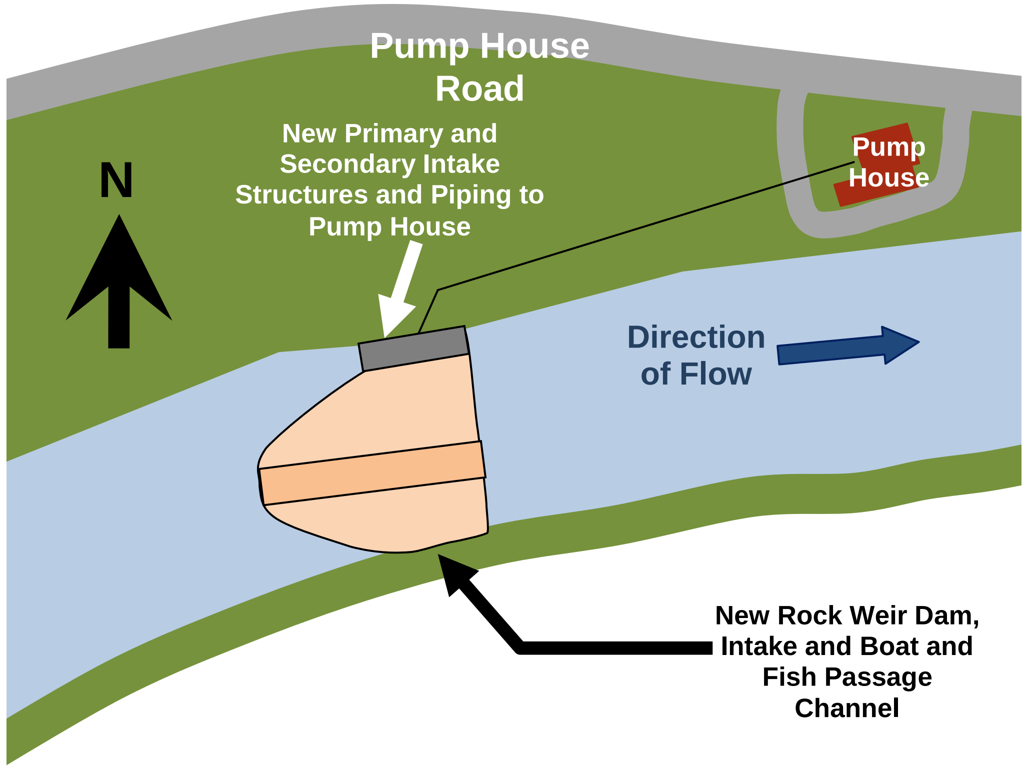
*Under Alternative 4, flows would not be regulated through an intake chute.

The dam would function by blocking the river flow and damming up the water level until it overtopped the boat and fish passage channel weir elevation. An upstream pool would be created with an approximate depth of five to six feet at the dam face. This upstream pool would provide an upstream water surface elevation of approximately 5,419 feet at all flows. This upstream water surface elevation would establish the amount of available head that could be used to convey water to the pumps through the position of a new intake and connector piping to be located on the north shoreline. The floating screens would be set at elevations 5,414 feet and 5,415 feet such that an available hydraulic head of four to five feet could be provided for conveyance of water through the intake piping and to the suction inlet of the pump station.

Alternative 5: Upstream New Rock Weir Dam and Intake

As with Alternatives 3 and 4, Alternative 5 would involve complete removal of the existing diversion dam and associated components and installation of a new rock weir dam with a boat and fish passage channel located at the apex. Figure 2-8 presents a graphical illustration of Alternative 5: New Upstream Rock Weir Dam, and Intake. Detailed engineered drawings are presented in Appendix C.

Figure 2-8 Illustration of Alternative 5: New Upstream Rock Weir Dam and Intake



As depicted in Figure 2-8, the new dam would be chevron shaped with the nose of the dam located upstream. The dam would function similarly to other dams in that it would serve as a flow impediment and thereby increase the upstream water surface profile. In Alternative 5, the existing diversion dam and associated features would be removed and replaced with a single concave rock weir located approximately 450 feet upstream.

The new rock weir dam would extend from approximately Station 35+25 to Station 38+75 with the crest beginning at a new south bank abutment, extending upstream 125 feet to the nose of a chevron shape and then back to a new north bank abutment. The crest of the rock dam would be at elevation 5,422 feet, with the upstream face gradually sloping to match the upstream river bottom elevation of 5,416 feet. The downstream face of the dam would also gradually slope to match the river invert elevation of 5,414 feet. The boat and fish passage channel would be located at approximately the river thalweg and would extend from dam crest downstream 325 feet. The spillway width would be designed to allow boaters to float through with oars extended; boaters would not experience any inconvenience while passing through the spillway. The profile of the new weir structure would include small downstream steps to gradually lose elevation down the rock face. The shape and elevation of the weir would be optimized to provide the desired upstream water surface and safe boating and fish passage. The rock weir would be visible during low flow conditions, while the intakes and intake structures would remain relatively hidden from view at all times. The rock weir would be constructed of quarried rock or native round rock as opposed to concrete in order to minimize visual impacts.

As with Alternatives 3 and 4, the fish and boat passage channel would consist of a “notch” through the dam that would be trapezoidal in shape and would extend from the upstream water pool through the dam section and blend into the downstream river channel. The channel would have a bottom section width of 27 feet and a top width of 73 feet and would include two rest pools measuring approximately 40 feet in length parallel to the river flow and 50 to 75 feet in width perpendicular to the river flow. The slope of the section of the chute immediately downstream of the crest would be approximately 3.8 percent and approximately 6.7 percent for the section between the first and second rest pools. Alternative 5 would also contain a third sloped section from the second rest pool to the existing natural pool located at approximately Station 35+25. This third sloped section would have a slope of 5.0 percent. The channel and rest pools would all be constructed from native or quarried rock grouted to form a natural channel. The grout would be placed such that at least six inches of the rock would be exposed to create an ideal environment for aquatic organisms.

The new dam would be constructed from grouted rock as well and would bear on a grouted rock keyway that would anchor the structure to the river bed. The dam would function by blocking the river flow and damming up the water level until it overtopped the boat and fish passage channel weir elevation. An upstream pool would be created with an approximate depth of five to six feet at the dam face. This upstream pool would provide an upstream water surface elevation of approximately 5,420 feet at all flows. This upstream water surface elevation would establish the amount of available head that could be used to convey water to the pumps through the position of a new intake and connector piping to be located on the north shoreline. A floating boom would be installed immediately upstream of the intake chute to redirect floating debris from the intake.

Alternative 5 would also include construction of new primary and secondary intake systems and new transmission piping from the intake system to the existing pump station. The primary intake would be located along the north river bank and would include screens for sediment removal. The new intake structure and functionality would be essentially identical as described under Alternative 2 and 3. Similarly, the intake control valve would involve either a butterfly gate valve or an Obermeyer gate valve with the same benefits as noted in the prior discussion. The secondary intake would be located slightly upstream and would include coarser screens or bar screens to provide short-term water delivery pending repair measures in the event of primary intake failure. New piping would convey raw water directly from the intake to the existing pumps, no longer routing through a settling basin. Because the existing point of diversion would be relocated, this alternative would require a point of diversion change application and approval through DNRC.

In analyzing Alternative 5, a river flow of 200 cfs was assumed to represent the mean average low flow. By varying the flow through the intake chute, the relative volume ratio of water was determined between the intake chute and the boat and fish passage channel. Table 2.3 illustrates this partition of flow for three conditions, as follows: 1) Fully unrestricted flow through the intake chute; 2) Fully restricted flow through the intake chute; and 3) Partial restricted flow.

Table 2.3 Flow Volume Partitioning Through Intake Chute and Boat / Fish Bypass Channel for Alternative 5

Condition	Intake Chute Volume (cfs)	Boat / Fish Bypass Channel (cfs)
Fully Unrestricted Flow in Intake Chute	150	50
Fully Restricted Flow in Intake Chute	0	200
Partially Restricted Flow in Intake Chute	100	100

Design features of the proposed Action Alternatives are summarized in Table 2.4.

Table 2.4 Summary of Design Features of Proposed Action Alternatives

Features	Alternative 2: Replace in Kind	Alternative 3: Rock Weir and New Pump House	Alternative 4: Rock Weir with Floating Intake	Alternative 5: Upstream Rock Weir
Dam Structure	• Remove all aspects of the existing dam and associated components • New concrete dam structure upstream of existing dam with stepped rock face to gradually lose elevation	• Remove all aspects of the existing dam and associated components • New rock weir located at existing diversion dam site with stepped rock face to gradually lose elevation	• Remove all aspects of the existing dam and associated components • New rock weir located at existing diversion dam site with stepped rock face to gradually lose elevation	• Remove all aspects of the existing dam and associated components • New rock weir located upstream of existing diversion dam site with stepped rock face to gradually lose elevation
Intake / Point of Diversion	• New primary intake located on north bank with slotted screen to block excessive sediment and debris (either butterfly gate valve or Obermeyer gate valve) • New secondary intake located on north bank upstream of primary intake • Floating boom to redirect floating debris from the intake • New point of diversion	• New primary intake located on north bank with slotted screen to block excessive sediment and debris (either butterfly gate valve or Obermeyer gate valve) • New secondary intake located on north bank upstream of primary intake • Floating boom to redirect floating debris from the intake • Utilize the existing point of diversion	• New primary intake (River Tee screens) located in natural pool approximately 300 feet upstream of existing diversion dam • New secondary intake located on north bank immediately upstream of rock weir • New point of diversion	• New primary intake approximately 450 feet upstream of existing facility with slotted screen to block excessive sediment and debris (either butterfly gate valve or Obermeyer gate valve) • New secondary intake located on north bank approximately 450 feet upstream of existing facility • Floating boom to redirect floating debris from the intake • New point of diversion
Settling Basin	• Remove existing settling basin; raw water conveyed directly to pump house	• Remove existing settling basin; raw water conveyed directly to pump house	• Remove existing settling basin; raw water conveyed directly to pump house	• Remove existing settling basin; raw water conveyed directly to pump house
Piping	• New pipe system to deliver raw water to the existing pump house	• "Wye" leg would accommodate piping to deliver raw water to the existing pump house under Phase I, as well as new piping to the new pump house under Phase II	• New pipe system to deliver raw water to the existing pump house	• New pipe system to deliver raw water to the existing pump house
Pump System	• New point of entry at existing pump house • Utilize existing pump system and configuration	• New point of entry at existing pump house during Phase I • New pump facility; existing pumps relocated at proper elevations under Phase II • New pump wet well to improve pump performance under Phase II	• New point of entry at existing pump house • Utilize existing pump system and configuration	• New point of entry at existing pump house • Utilize existing pump system and configuration
Safety Features	• Improved safety for maintenance personnel due to reduction in icing problems • Improved safety for boaters due to stepped rock face as compared to existing sharp vertical drop	• Improved safety for maintenance personnel due to reduction in icing problems • Improved safety for boaters due to stepped rock face as compared to existing sharp vertical drop	• Improved safety for maintenance personnel due to reduction in icing problems • Improved safety for boaters due to stepped rock face as compared to existing sharp vertical drop	• Improved safety for maintenance personnel due to reduction in icing problems • Improved safety for boaters due to stepped rock face as compared to existing sharp vertical drop
Boat and Fish Passage	• No boat or fish passage features	• Notched weir and stepped rock spillway provide improved boat and fish passage; Spillway width designed to allow boaters to float through with oars extended	• Notched weir and stepped rock spillway provide improved boat and fish passage; Spillway width designed to allow boaters to float through with oars extended	• Notched weir and stepped rock spillway provide improved boat and fish passage; Spillway width designed to allow boaters to float through with oars extended

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2.3 Alternatives Considered but Eliminated from Further Analysis

As noted in Section 2.2, the four Proposed Action Alternatives assume continued use of BSB's existing water right on the Big Hole River as a source of water for the Butte service area. This section documents consideration and assessment of other alternatives, which fall into the following categories: 1) Reducing Water Needs; 2) Alternative Water Sources; and 3) Diverting Water From a Different Location on the Big Hole River.

Reducing Water Needs

The Butte-Silver Bow water system was initially constructed over 100 years ago to meet the needs of the regional mining industry. Over time, serious leakage problems began to occur due to aging distribution and transmission piping. A lack of metering also contributed to high demands. BSB has been aggressively replacing leaking system components and implementing water usage metering over the past five to ten years. These conservation efforts have reduced the amount of water required, however, these improvements are not sufficient to supplant the Big Hole River source.

Alternative Water Sources

New Appropriations and Water Right Considerations

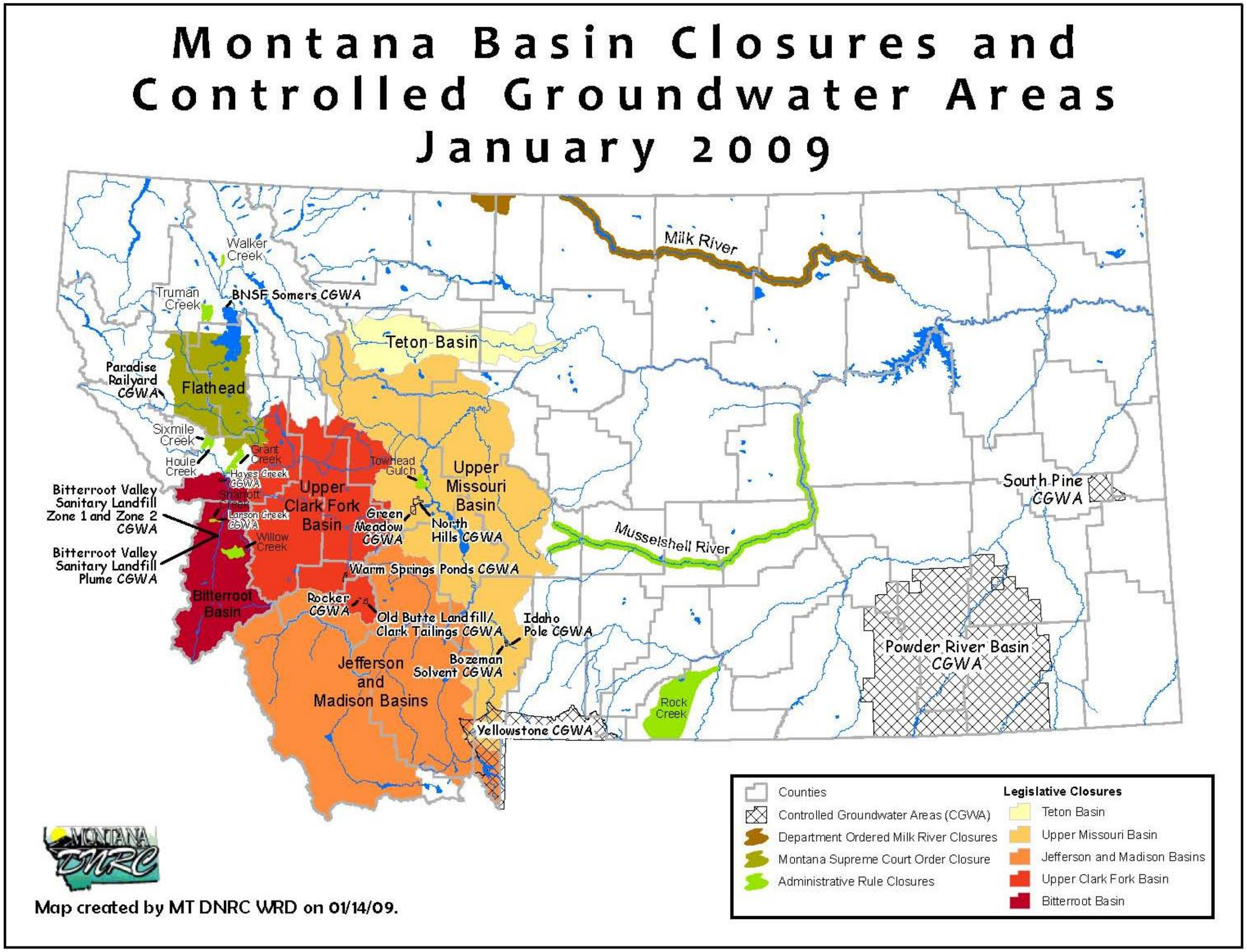
As shown in Figure 2-9, the Upper Clark Fork and the Madison and Jefferson Basins have been closed to new appropriations by legislative authority. Obtaining a new water right in a closed basin requires extensive analysis to show that the water being used will be replaced or "mitigated" such that the net loss from the basin (including groundwater and/or surface water) is zero. Mitigation could include return of highly treated wastewater to the system, or retirement of a separate existing water right to make up the difference. The Big Hole River is located in the Jefferson and Madison basin, while the Butte service area is located in the Upper Clark Fork Basin. Accordingly, retirement of the Big Hole River water right would not be considered appropriate mitigation for a new water right in the Upper Clark Fork region. It is not clear whether a basin-to-basin mitigation transfer would be possible under Montana law.

In addition to proving appropriate mitigation, the following DNRC criteria must be met:

1. Demonstrate that water is physically and legally available at the site
2. Demonstrate that nearby water resources will not be adversely affected (i.e. neighboring wells, streams, irrigation ditches, and other sources)
3. Demonstrate beneficial use

Several hydrogeological factors must be evaluated to determine if water is physically available at the site. This would most likely require the drilling of test wells to conduct aquifer tests, water quality tests, and water level monitoring. Stream flow monitoring may also be required. Once physical availability is demonstrated, legal availability must be demonstrated through identification and analysis of existing water rights in the vicinity and with regard to potentially-affected surface waters. This process involves substantial research into existing water rights and a comparison of existing legal demands to physical water availability. To demonstrate beneficial use, the proposed water use must be justifiable in regards to how it will be used as well as the quantity of water needed. In sum, acquiring additional water rights is a fairly lengthy process requiring substantial analysis.

Figure 2-9 Montana Basin Closures



Source: DNRC, 2009.

The difficulties of obtaining new groundwater and surface water sources are explained more fully below.

Groundwater

As noted in the 2008 Butte Water Master Plan, groundwater and soils in the Butte area are generally contaminated with arsenic and other heavy metals, including copper, zinc, cadmium, and lead, resulting from past mining practices. There is some question whether existing technology could treat contaminated groundwater to drinking water standards. Further, as noted previously, Butte is located in a controlled groundwater area and a closed basin. In order to pursue a new water right, additional study would be required to identify potential mitigation measures and to determine physical availability and potential adverse effects on existing uses. Even if the results of these analyses were favorable, it likely would not be possible to obtain a new water right before the existing Big Hole River diversion dam fails given the near-term risk of dam failure. At this time, it is believed that groundwater sources would not provide sufficient volumes to supplant the Big Hole River source. Lastly, utilizing a new groundwater source for Butte potable water needs would likely require new transmission piping through previously undisturbed areas, which would likely result in greater environmental impacts as compared to using the existing Big Hole River transmission system. For these reasons, groundwater sources were eliminated from further consideration.

Surface Water

Surface water sources close to the Butte service area are illustrated in Figure 2-10. Surface water contamination exists in the region; the Silver Bow Creek/Butte Area Site is on the U.S. Environmental Protection Agency's (EPA's) National Priorities List. There is some question whether existing technology could treat contaminated surface water to drinking water standards.

BSB currently has an existing Silver Lake water right, but this water right alone would not be sufficient to supply both domestic and industrial uses currently supplied by the combined Silver Lake and Big Hole River sources. Although BSB's Silver Lake water right is approximately 20 million gallons per day (mgd), the current delivery pipeline is capable of carrying only 16 to 18 mgd. Under BSB's total water right, current Silver Lake reserved uses include Renewable Energy Corporation (REC - Silicon), Montana Resources (MRI), Atlantic Richfield Company (ARCO), Northwestern Energy, the community of Anaconda, and various small-scale irrigators in the region. In addition to daily uses, MRI also has a right to a larger volume of water for planned and unplanned system failures, amounting to between 7 mgd and 18 mgd. Should an MRI system failure occur, BSB's water right is not sufficient to supply the full allotment of water to each of these users. In such an event, BSB would have to supply water to these users from its potable supply, resulting in a net loss to the BSB system.

The Silver Lake water system is a highly adjudicated surface water source. As noted previously, new or additional water rights for Silver Lake and Georgetown Lake would be very difficult to obtain in a timely manner due to basin closure restrictions; time is of the essence due to the near-term risk of dam failure at the Big Hole site. There is no unclaimed water in the Silver Lake system and it is unlikely that current users would be willing to sell their water rights to BSB.

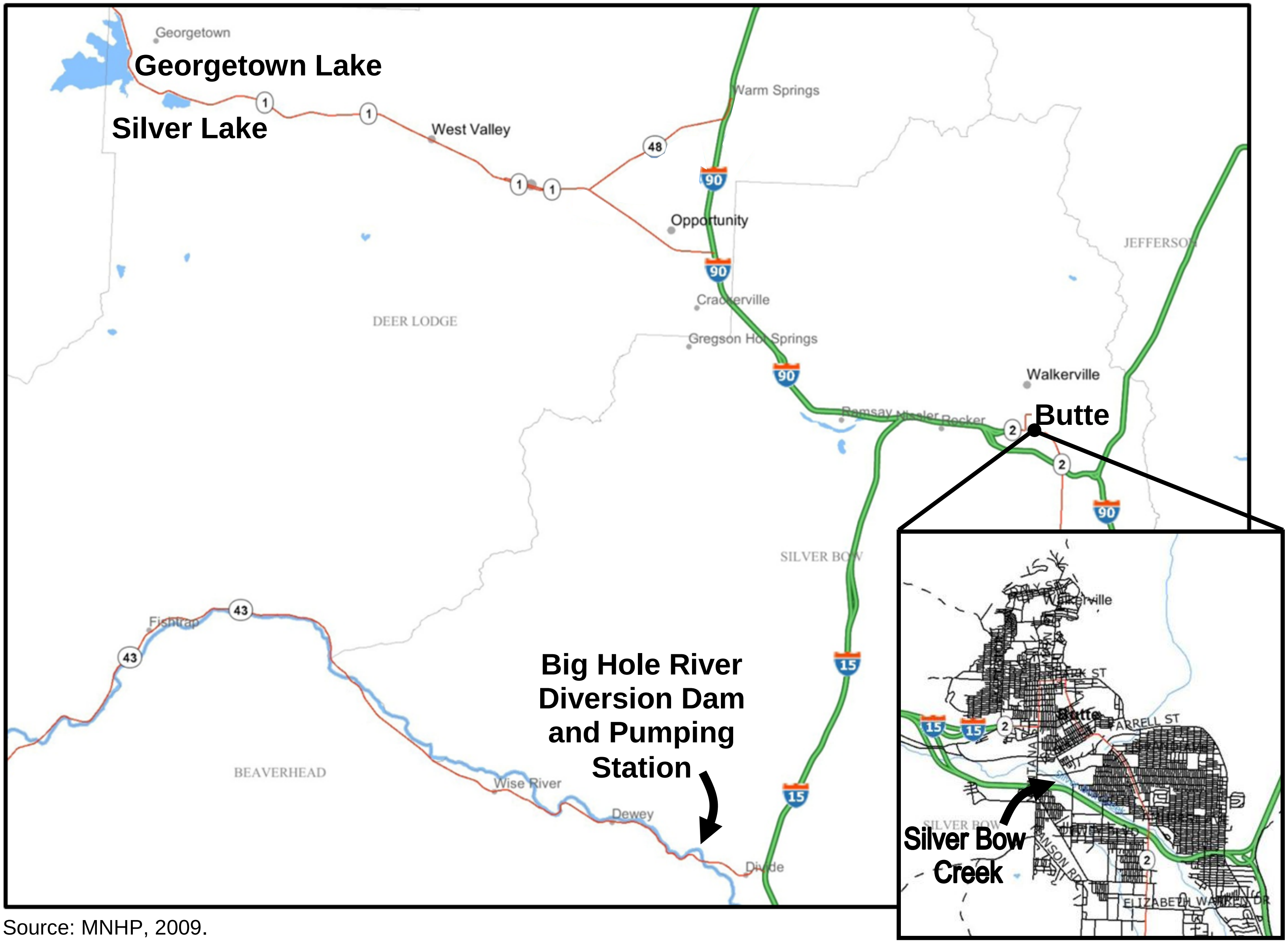
Lastly, the Silver Lake water source does not meet drinking water standards. In order to use this water source for Butte's potable water needs, the water would need to be piped to the Big Hole

Water Treatment Plant for proper treatment, and then piped back up Butte. This would require repair of existing transmission lines and construction of new transmission lines through previously undisturbed areas, which would result in greater environmental impacts as compared to using the existing Big Hole River water source. For these reasons, alternative surface water sources were eliminated from further consideration.

Diverting Water from a Different Location on the Big Hole River

During agency coordination activities, resource agencies suggested consideration of an abandoned upstream irrigation weir on the south side of the river as an alternative to a new diversion dam structure (see meeting summary contained in Appendix J). The thought was that since it would be located at a higher elevation, this alternative could provide sufficient head without use of a rock weir structure. Such an alternative would not be located on BSB-owned land, and would therefore involve right-of-way negotiations not contemplated with the other alternatives; this alternative would also require lengthy water right adjudications. Further, by providing a single drop, this alternative would result in the same "keeper wave" and associated safety concerns as the existing dam; the single suggested drop would still need to meet a minimum elevation in order to ensure water entry into the intake pipe. Lastly, the abandoned irrigation weir has naturally eroded over time; a new structure would need to be constructed in its place in order to function properly, thereby eliminating any gains from an environmental resource impact standpoint. For these reasons, use of the abandoned irrigation weir was eliminated from further consideration.

Figure 2-10 Surface Waters in Proximity to Butte Service Area



Source: MNHP, 2009.

3.0 Affected Environment

3.1 Natural and Physical Environment

3.1.1 Geology

The Big Hole River Diversion Dam is located on the eastern edge of the Pioneer Mountain Range. As noted in the Geotechnical Data Report prepared for this project (Appendix E), existing geologic mapping for this area shows that this site consists of Quaternary alluvium overlaying Cretaceous- to Mississippian-age marine sedimentary rocks dipping steeply to the east.

3.1.2 Topography

According to the Geotechnical Data Report, topography at the project site is characterized by a deeply incised V-shaped valley sloping up steeply to the north and south of the Big Hole River. A broad, relatively flat alluvial terrace is present along the south side of the river about 30 to 35 feet above the river surface elevation. Surrounding topography is generally mountainous to the east, north, and south, opening up into a broader floored river valley towards the east. Due to the mountainous conditions at the site, the Big Hole River does not naturally meander widely.

3.1.3 Soils

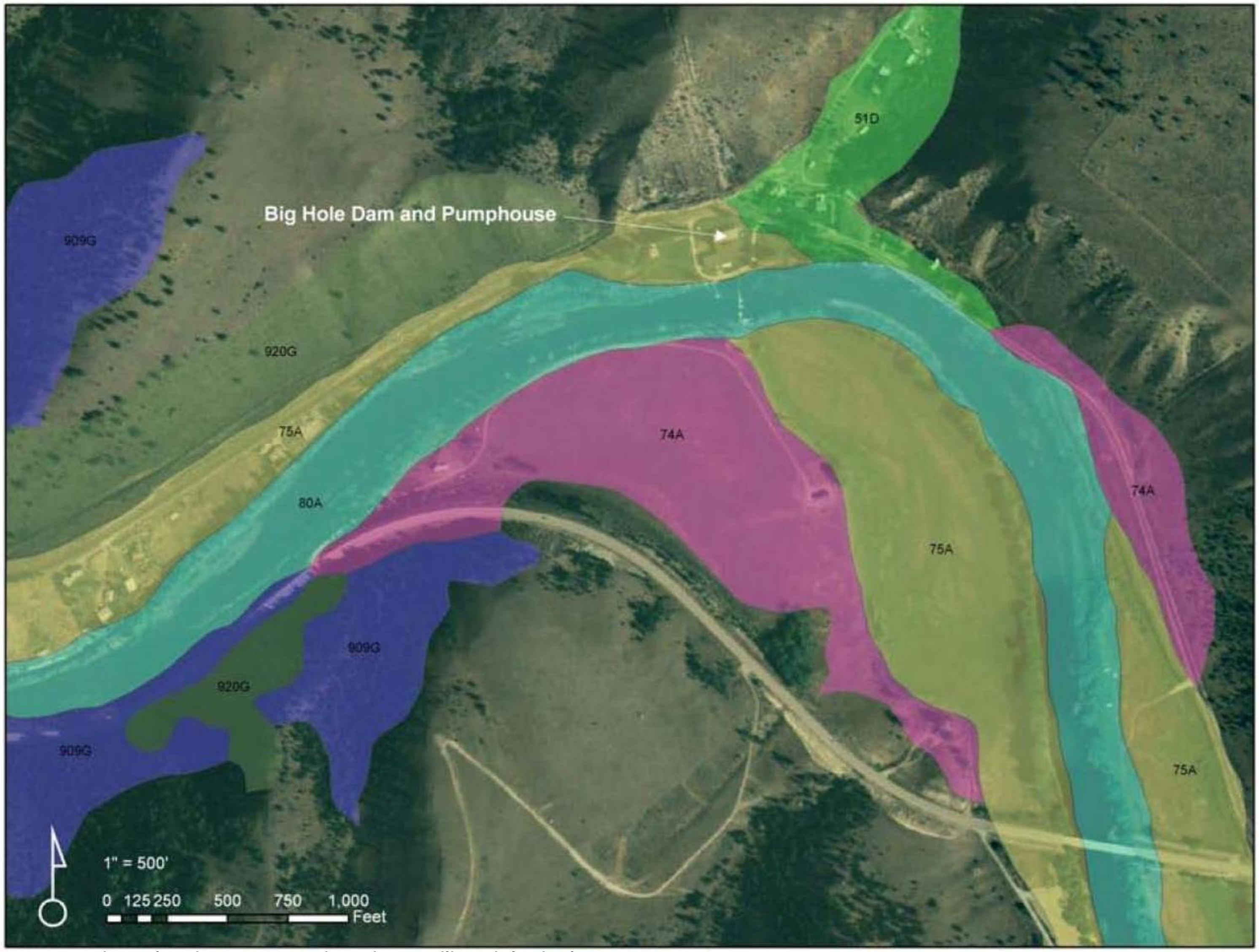
Based on a review of the Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database, there are six soil types within the vicinity of the project area, which are presented in Table 3.1 and Figure 3-1.

Table 3.1 Soils within Project Area

Soil Symbol	Soil Name and Description
51D	Foxgulch-Libeg complex, 6 to 25 percent slopes, stony
74A	Bearmouth very cobbly sandy loam, 0 to 2 percent slopes, very stony
75A	Danielvil loam, 0 to 2 percent slopes
80A	Water-Riverwash complex
909G	Rubick, rubbly–Rubble land complex, 40 to 75 percent slopes
920G	Poin, rubbly-Rubble land-rock outcrop complex, 40 to 80 percent slopes

Source: Big Hole River Dam and Intake Facility Biological Resources Report, 2009.

Figure 3-1 Soils within Project Area



Source: Big Hole River Dam and Intake Facility Biological Resources Report, 2009.

As noted in the Butte Water Master Plan (RPA, 2008), soils within the general project area are shallow and moderately deep cobbly loams, silt loams, and sandy loams, some with heavier textured loam and clay loam subsurface layers. Alpine glaciation has modified portions of the landscape in the area. Soils are moderately susceptible to erosion and some are susceptible to rutting and compaction.

3.1.4 Vegetation

Vegetation in the study area consists primarily of native grasses with scattered brush on the south side of the river and maintained lawn areas, native grasses, brush, and trees on the north side of the river. A vegetation inventory conducted for this project identified 18 trees/shrubs, 30 forbs, 13 grasses, and one macrophyte species within the project area. The riparian vegetation present along the banks of the Big Hole River consists of a mosaic of cottonwood/red-osier dogwood, willow/herbaceous, and Douglas fir-dominated community types. A moderately rich diversity of shrubs and herbaceous understory is present along both banks of the river, with the exception of the maintained and manicured area directly adjacent to the intake facility. Willows, alder, serviceberry, currant, and chokecherry are the dominant shrubs throughout the riparian areas. The herbaceous community transitions from predominately hydrophytes, including water knotweed, spike rush and horsetail, to canary reedgrass, mannagrass and foxtail barley, and then into upland species within a short distance from the river bank. Irrigation ditches run along both sides of the river and sustain a narrow band of hydrophytic vegetation along the edges of these canals. The arid uplands adjacent to the southern bank are characterized by sagebrush, skeleton weed, wheatgrass and needle and thread grass. The Biological Resources Report (BRR) prepared for this project contains a full listing of vegetative species found within the project area and is included in Appendix F.

Threatened and Endangered Species / Species of Special Concern

The Montana Natural Heritage Program (MNHP) lists the Sapphire rockcress, a state Species of Special Concern, as occurring within the township and range where the existing Big Hole Diversion Dam and Pump House are located. No Threatened or Endangered plant species or plant Species of Special Concern were observed during site visits or are known to exist within the project area.

Noxious Weeds

Six Category 1 and one Category 2 noxious weed species were identified within the project area, as listed in Table 3.2.

Table 3.2 Noxious Weeds Identified at Project Site

Common Name	Scientific Name	Noxious Weed Category
Spotted knapweed	*Centaurea stoebe*	Category 1
Common tansy	*Tanacetum vulgare*	Category 1
Canada thistle	*Cirsium arvense*	Category 1
Yellow toadflax	*Linaria vulgaris*	Category 1
Houndstongue	*Cynoglossum officinale*	Category 1
Oxeye daisy	*Chrysanthemum leucanthemum*	Category 1
Rush skeletonweed	*Chondrilla juncea*	Category 2

Source: Big Hole River Dam and Intake Facility Biological Resources Report, 2009.

Category 1 noxious weeds are defined by the Montana Department of Agriculture as weeds that are currently established and generally widespread in many counties of the state. Management criteria include awareness and education, containment and suppression of existing infestations, and prevention of new infestations. These weeds are capable of rapid spread and render land unfit or greatly limit beneficial uses. Category 2 noxious weeds are defined as having recently been introduced into the state or rapidly spreading from their current infestation sites. These weeds are capable of rapid spread and invasion of lands, rendering lands unfit for beneficial uses. Management criteria include awareness and education, monitoring and containment of known infestations, and eradication where possible.

3.1.5 National Wildlife Refuges, Parks, Preserves, Monuments & Wild & Scenic Rivers

There are no National Wildlife Refuges, National Parks, Preserves, Monuments, or Wild and Scenic Rivers in the project vicinity.

3.1.6 Wildlife

As noted in the BRR prepared for the proposed project, the Big Hole Dam lies within an area that is diverse in wildlife habitat. The dam and intake facility are located within a transitional area of the Big Hole River as it exits a canyon and enters a broader valley. The facility lies at the foot of the Pioneer Mountains, which provide habitat for several big-game species including whitetail deer, mule deer, moose, and elk. The facility lies adjacent to dry, upland habitats, suitable for mountain lion, coyotes, red fox, bobcats, black bear, and upland birds such as Hungarian partridge and ruffed grouse. Birds of prey including owls, hawks, eagles, and osprey are commonly found within the area. The site lies within the riparian zone of the river, which provides habitat for several species of migratory songbirds and mammals such as otter, beaver, and muskrat. Several species of waterfowl utilize the river corridor for feeding, nesting, and migration.

Threatened and Endangered Species / Species of Special Concern

According to the MNHP database, three mammals, two birds, and one amphibian that may occur within the vicinity of the project area are classified as Species of Special Concern, and are listed in Table 3.3.

Table 3.3 Wildlife Species of Special Concern in the Vicinity of the Project Area

Species	Global Rank	State Rank	FWS Status	USFS Status	BLM Status
Mammals					
Gray Wolf (*Canis lupus*)	G4	S3	DM	Sensitive	Sensitive
Wolverine (*Gulo gulo*)	G4	S3		Sensitive	Sensitive
Canada lynx (*Lynx Canadensis)*	G5	S3	LT	Threatened	Special Status
Birds					
Northern goshawk (*Accipiter gentilis*)	G5	S3			Sensitive
Brewer's sparrow (*Spizella breweri*)	G5	S3B			Sensitive
Amphibians					
Western toad (*Bufo boreas*)	G4	S2		Sensitive	Sensitive

Source: Big Hole River Dam and Intake Facility Biological Resources Report, 2009.

S1/G1 At high risk because of extremely limited and/or rapidly declining population numbers, range, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.
S2/G2 At risk because of very limited and/or potentially declining population numbers, range, and /or habitat, making it vulnerable to global extinction or extirpation in the state
S3/G3 Potentially at risk because of limited and/or declining numbers, range and/or habitat, may be abundant in some areas.
S4/G4 Apparently secure, thought it may be quite rare in parts of its range, and/or suspected to be declining.
S5/G5 Demonstrably secure, though it may be quite rare in parts of its range
B Breeding – Rank refers to the breeding population of the species in Montana.
DM Recovered, delisted, and being monitored - Any previously listed species that is now recovered, has been delisted, and is being monitored.
LT Listed threatened - Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(20)).

3.1.7 Fisheries

The Big Hole River is considered a "Blue Ribbon" trout stream due to its superb recreational fishing opportunities. According to the FWP Montana Fisheries Information System (MFISH) database, there is a moderately diverse mix of native and introduced fish species present in the Big Hole River near the project site, as listed in Table 3.4. It should be noted that the MFISH database assigns upstream and downstream endpoints based on river stationing beginning at the mouth of the river. River Mile 0.0 is located at the confluence of the Big Hole River with the Jefferson River; River Mile 153.1 represents the upstream extent of the Big Hole River. The existing Big Hole River Diversion Dam and Pump House are located at River Mile 54.1.

Table 3.4 Fish Distribution Data for the Big Hole River in the Vicinity of River Mile 54.1

River Mile (Begin Point)	River Mile (End Point)	Species	Abundance	Use Type	Origin
0	56.5	Arctic Grayling*	Rare	Year-round resident	Native
56.5	115	Arctic Grayling*	Common	Year-round resident	Native
0	63	Brook Trout	Rare	Year-round resident	Introduced
63	95	Brook Trout	Common	Year-round resident	Introduced
0	81.4	Brown Trout	Abundant	Year-round resident	Introduced
0	73.6	Burbot	Common	Year-round resident	Native
0	153	Longnose Dace	Common	Year-round resident	Native
0	153	Longnose Sucker	Common	Year-round resident	Native
0	153	Mottled Sculpin	Common	Year-round resident	Native
0	153	Mountain Sucker	Rare	Year-round resident	Native
0	143.4	Mountain Whitefish	Abundant	Year-round resident	Native
6.2	86.7	Rainbow Trout	Abundant	Year-round resident	Introduced
54.9	68.8	Westslope Cutthroat Trout*	Rare	Unknown	Native
61.5	68.7	Westslope X Rainbow	Rare	Unknown	Unknown
0	89.3	White Sucker	Common	Year-round resident	Native

Source: Big Hole River Dam and Intake Facility Biological Resources Report, 2009.
*State Species of Special Concern

The Big Hole River is considered an outstanding resource due to high sport and habitat classifications. It should be noted that there is a backwater pool located upstream of the existing diversion dam structure that provides important habitat for fish.

Threatened and Endangered Species / Species of Special Concern

The Big Hole River contains two state Species of Special Concern within the vicinity of the existing dam: the arctic grayling and the westslope cutthroat trout. No Threatened or Endangered fish species exist in the Big Hole River.

Fish Passage

The configuration of the existing diversion dam likely creates a fish passage barrier at various flows. At low flows, fish passage is limited due to the height of the dam above the bed of the river. At high flows, fish passage is limited due to high velocities as water passes over the dam. However, fish are likely to pass over the dam at intermediate flows that do not restrict jumping height or burst speeds. Fish may also pass through the existing dam at various flows in locations where temporary rocks have been placed to stabilize undercuts in the dam.

When considering fish passage at structural facilities, three aspects of fish swimming speeds may be considered. These include 1) cruising speed, or a speed that can be maintained for a number of hours; 2) sustained speed, or a speed that can be maintained for minutes; and 3) darting speed, which is a single, bursting effort that is not sustainable. Fish passage may be restricted if water velocities in the vicinity of in-stream structures exceed the sustained speed of a particular fish species.

Table 3.5 presents cruising, sustained, and darting speeds for adult fish that are known to exist within the project area. It is assumed that each of these species would attempt to pass upstream of the dam during seasonal migrations. No data for rainbow trout were available; however, it is assumed that rainbow trout have similar swimming speeds as brown and cutthroat trout. Based on these data, fish passage will be achievable for trout and grayling when water velocities at the dam are below 6 fps, and below 4 fps for whitefish. For purposes of this project, the maximum velocity supporting fish passage has been established at 6 fps in coordination with FWP.

Table 3.5 Swimming Speeds for Adult Fish found in the Big Hole River

Species	Cruising Speed (ft/sec)	Sustained Speed (ft/sec)	Darting speed (ft/sec)
Cutthroat trout	2	6	14
Brown trout	2	7	13
Grayling	2	7	14
Whitefish	1	4	9

Source: Big Hole River Dam and Intake Facility Biological Resources Report, 2009.

Passage over the dam may also be limited by fish size. While larger, stronger fish may be capable of successfully jumping over or swimming past the dam crest, younger and smaller size classes may not. Table 3.5 presents swimming speeds of adult trout and whitefish, which typically reach maturity at three years. Therefore, the presence of the dam could additionally limit passage for younger age classes; during higher flows, passage may be possible only for adult age classes.

Based on modeling efforts conducted for this project, the highest velocity estimated for the study area under existing conditions is 12 fps for the 100-year flood event at Section 31+12, which is located approximately 90 feet downstream of the existing dam. Velocities for the 100-year flood event range from 6 to 8 fps at other intervals throughout the project area.

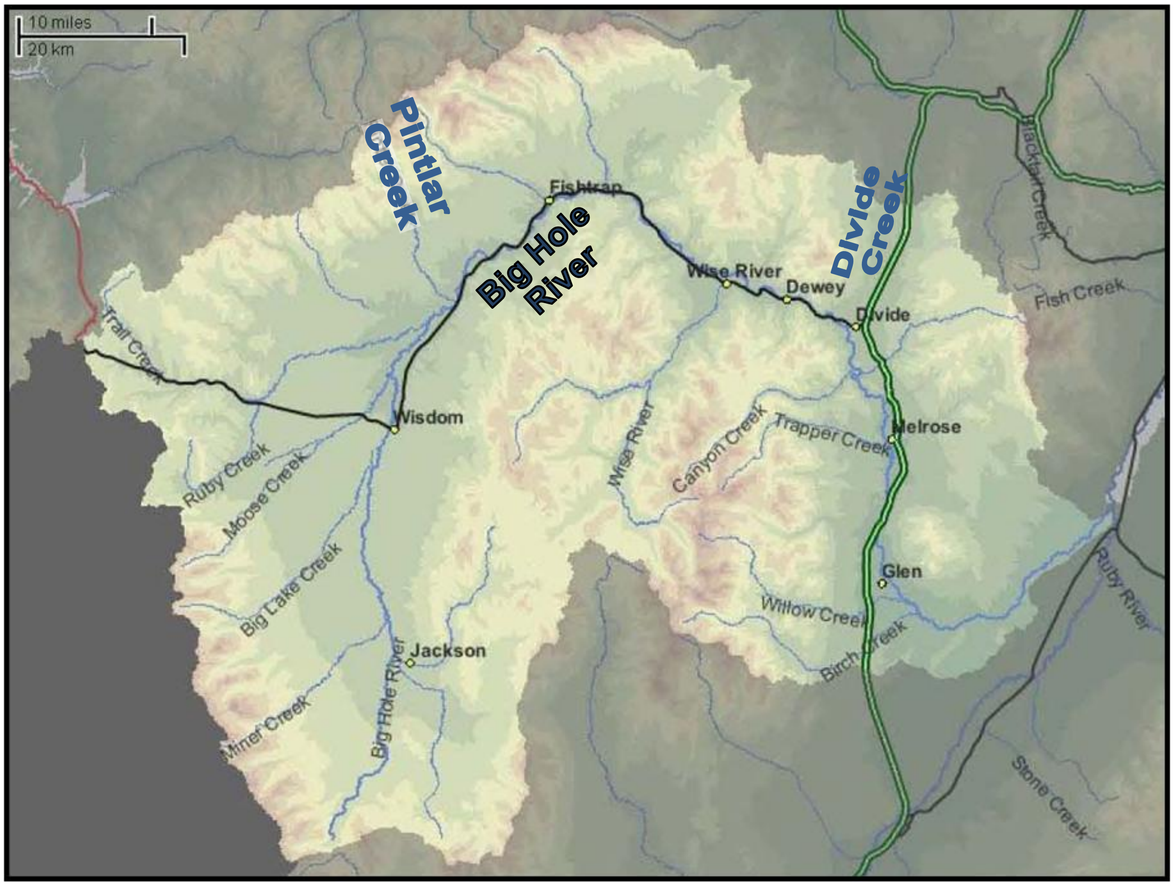
Seasonal behavior of grayling and trout includes upstream migration during spawning periods. Spawning habitat has been documented in many tributary streams and upper reaches of the mainstem Big Hole River above the existing diversion dam. Fish species that spawn during spring months (April-June) include arctic grayling, rainbow trout, and cutthroat trout. The existing diversion dam may serve as a barrier to these species during spawning migrations that can overlap with high flow events during spring runoff. During periods of low flow (September-November), the existing dam may act as a barrier to upstream movement by species that spawn in the fall, including brown and brook trout, due to the height of the dam as compared to jumping heights of fish.

Fish passage barriers are increasingly being used by fisheries managers to protect the genetic integrity of native species. Genetically pure populations of Westslope cutthroat trout currently exist in headwater and tributary streams upstream of the Big Hole Dam. The placement or maintenance of passage barriers at strategic locations within the watershed may aid in protecting the genetic integrity of cutthroats from introgression by rainbow trout. Barriers may also restrict colonization by non-native species such as brown and brook trout, which may out-compete native cutthroat trout and grayling in overlapping habitats. However, maintenance of the existing dam as a passage barrier would not be an effective strategy for protecting cutthroat genetics or preventing non-native species from inhabiting the upper portions of the river, as non-native species have already colonized upstream of the dam. Brown trout and rainbow trout have been documented well upstream of the Big Hole Dam; therefore, removal of the dam would not allow upstream migration of these species to areas where they do not currently exist. Removal of the dam would provide year-round passage opportunities for all fish, both native and non-native, to reaches of the Big Hole River upstream of the dam.

3.1.8 Water Resources and Water Quality

The Big Hole River Diversion Dam and Pump House lie within the Big Hole Subbasin of the Upper Missouri River Basin. The Big Hole Subbasin is defined as Hydrologic Unit Code (HUC) 10020004 and is illustrated in Figure 3-2. The Big Hole Subbasin is further divided into individual watersheds; the project area is located in the Divide watershed (HUC 1002000411), which encompasses approximately 170.7 square miles and 109,265 acres in Silver Bow and Beaverhead Counties.

Figure 3-2 Big Hole Subbasin of the Upper Missouri River Basin



Source: Montana Big Hole Watershed Mapping Project, 2009.

As noted in the Butte Water Master Plan (RPA, 2008), the Big Hole River's headwaters are located in the Beaverhead Mountains of the Bitterroot Range southwest of Jackson, Montana. The river flows for approximately 150 miles before joining with the Beaverhead River at Twin Bridges to form the Jefferson River. Within the vicinity of the project area, the Big Hole River generally flows from west to east and forms the boundary between Silver Bow and Beaverhead Counties. As noted in Section 3.1.2, the Big Hole River is generally constrained in a V-shaped valley and does not meander widely, as there is little room to diverge from its current course.

The Big Hole River between Divide Creek and Pintlar Creek is listed as impaired on the Montana Department of Environmental Quality (DEQ) 2008 Integrated 303(d) Water Quality Assessment Database for not supporting aquatic life, cold water fisheries, or domestic drinking water. Probable causes of impairment are metals, low flow alterations, substrate alterations, water temperature, and other streamside habitat alterations. The probable sources of impairment are associated with past mining activities, grazing, irrigated crop production, and construction activities like road building.

The State of Montana classifies the Big Hole River as an A-1 surface water. A-1 surface waters are to be maintained suitable for drinking, culinary, and food processing purposes after conventional treatment for removal of naturally present impurities. Water quality must be maintained suitable for bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

3.1.9 Floodplains

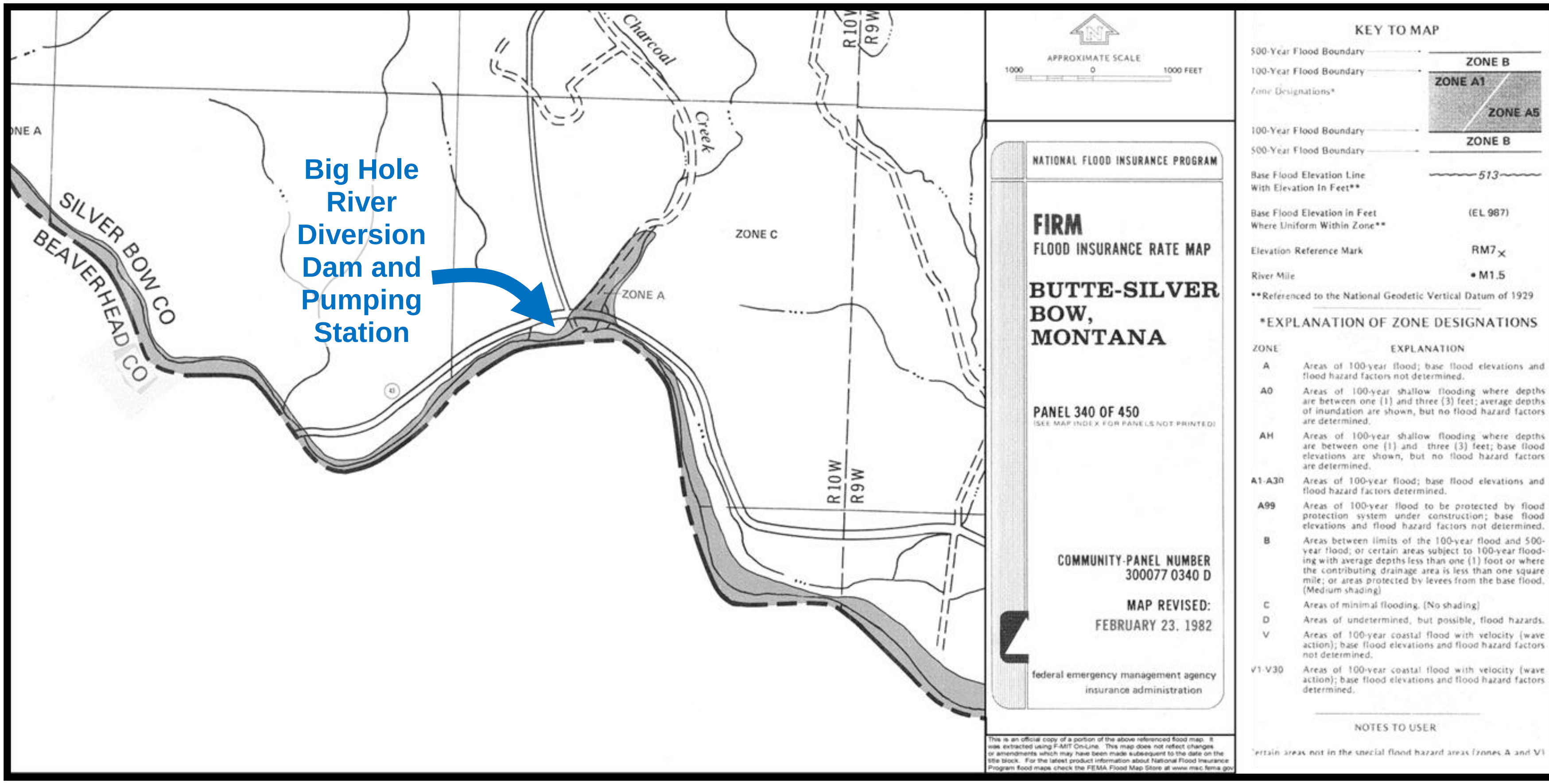
Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP) floodplain mapping is only available for the portion of the proposed project located in Silver Bow County. There is no floodplain mapping for Beaverhead County.

As depicted in Figure 3-3, the proposed project is located within a regulatory 100-year floodplain. A 100-year flood event is defined as having a 100-year recurrence interval, or a one in 100 (one percent) probability of occurrence in any given year. It should be noted that the existing pump house is located within the 100-year floodplain.

As shown in Figure 3-3, the available NFIP mapping illustrates areas of inundation, but does not provide flood elevations. In the absence of elevation mapping, baseline floodplain information was developed using a model that estimated approximate water surface elevations expected to result during low flow (200 cfs), two-year (7,239 cfs), and 100-year (16,712 cfs) flow events under existing conditions. Based on the results of this model, the existing pump house is expected to be inundated during a 100-year flood event.

As noted in Chapter 2, the low flow value of 200 cfs was selected as the minimum instream flow under which the intake and pumping system must remain operable. All Action Alternatives are expected to function under these low flow conditions, but system performance would be diminished at flows below 200 cfs.

Figure 3-3 NFIP Floodplain Mapping within Project Area



Zone A: Area of 100-Year flood; base flood elevations and flood hazard factors not determined.

3.1.10 Wetlands and Other Regulated Areas

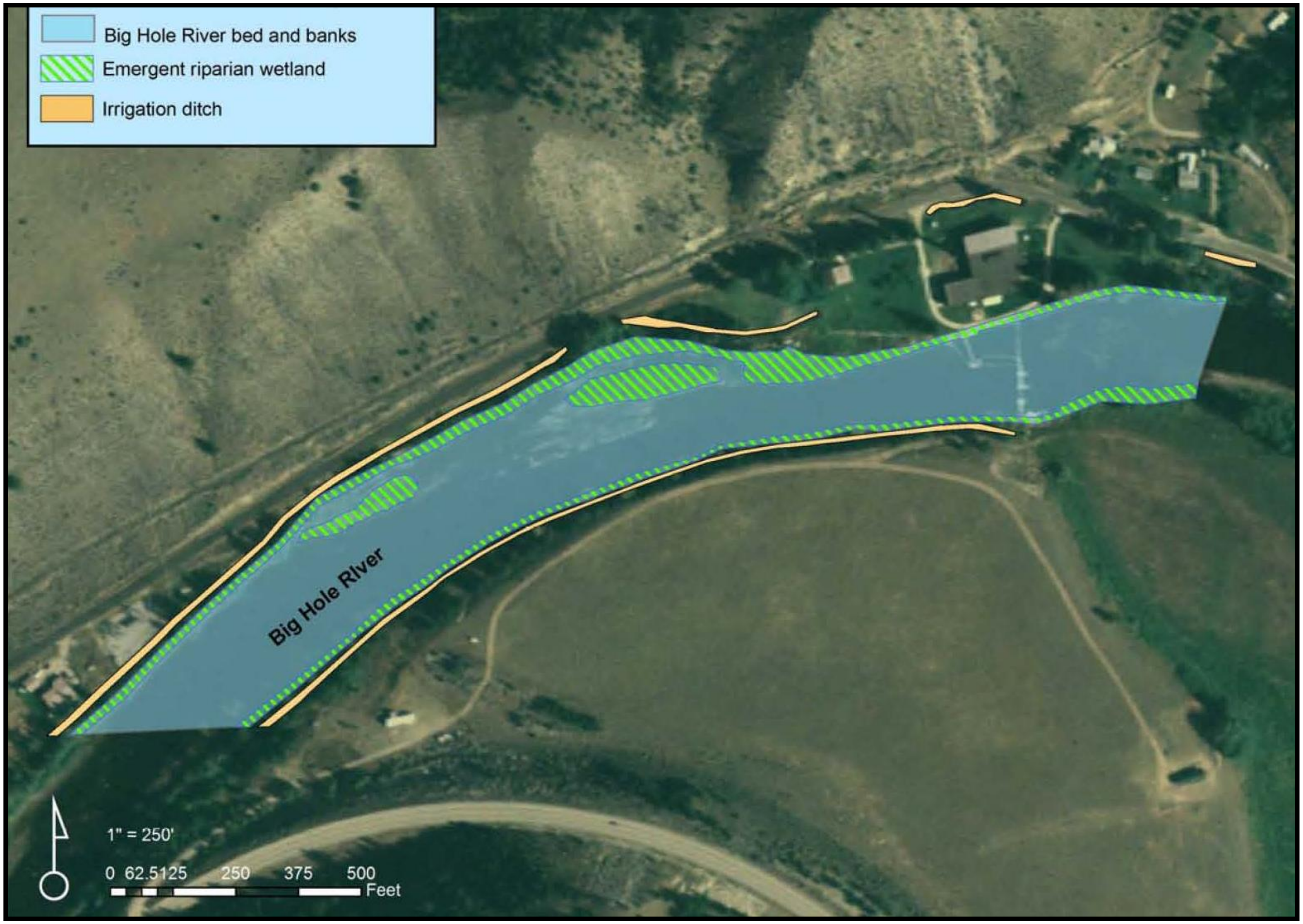
A wetland delineation was conducted during site visits in August 2009 from approximately 500 feet downstream of the existing diversion dam to approximately one-half mile upstream of the structure. The delineation was conducted in compliance with the 1987 Corps of Engineers Wetland Delineation Manual of the U.S. and the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (April 2008). A functions and values assessment of wetlands was also conducted using methods developed by the Montana Department of Transportation (MDT) (Berglund, 1999).

Waters of the U.S. and Irrigation Ditches

The Big Hole River is considered a Water of the U.S.; areas within its bed and banks as defined by the ordinary high water mark are therefore considered jurisdictional under USACE Section 404 permitting guidelines. Delineated boundaries and their respective classifications are illustrated in Figure 3-4. It should be noted that all areas classified as wetlands were found within the high water mark of the Big Hole River; no isolated wetlands were identified within the project area. Fill material placed within regulated Waters of the U.S. and/or jurisdictional wetlands require compensatory mitigation at ratios determined by the U.S. Army Corps of Engineers. Potential impacts resulting from each Action Alternative are discussed in Chapter 4 of this document.

Irrigation ditches running to the north and south of the river were not surveyed during the site visit; ditches were assessed from topographic survey maps of the project reach. Incidental groundwater seepage from the irrigation canal contributes to wetland hydrology along the margins of the riparian zone and extends the boundary of the wetland up gradient in these select areas. The irrigation ditch along the north bank has an apparent surface water nexus to the Big Hole River and may be jurisdictional. The irrigation ditch along the south bank does not appear to have a significant nexus and does not appear to be jurisdictional. Preliminary jurisdictional determinations are subject to USACE concurrence.

Figure 3-4 Delineated Wetland, River and Irrigation Features within Project Area



Source: Big Hole River Dam and Intake Facility Biological Resources Report, 2009.

3.1.11 Air Quality

The proposed project is located in an unclassifiable/attainment area of Montana for air quality under 40 CFR 81.327, as amended. As such, this proposed project is not covered under EPA's "Final Rule" of September 15, 1997 on Air Quality Conformity.

3.2 Human Environment

3.2.1 Land Use / Right of Way and Easements / Utilities

Land Use

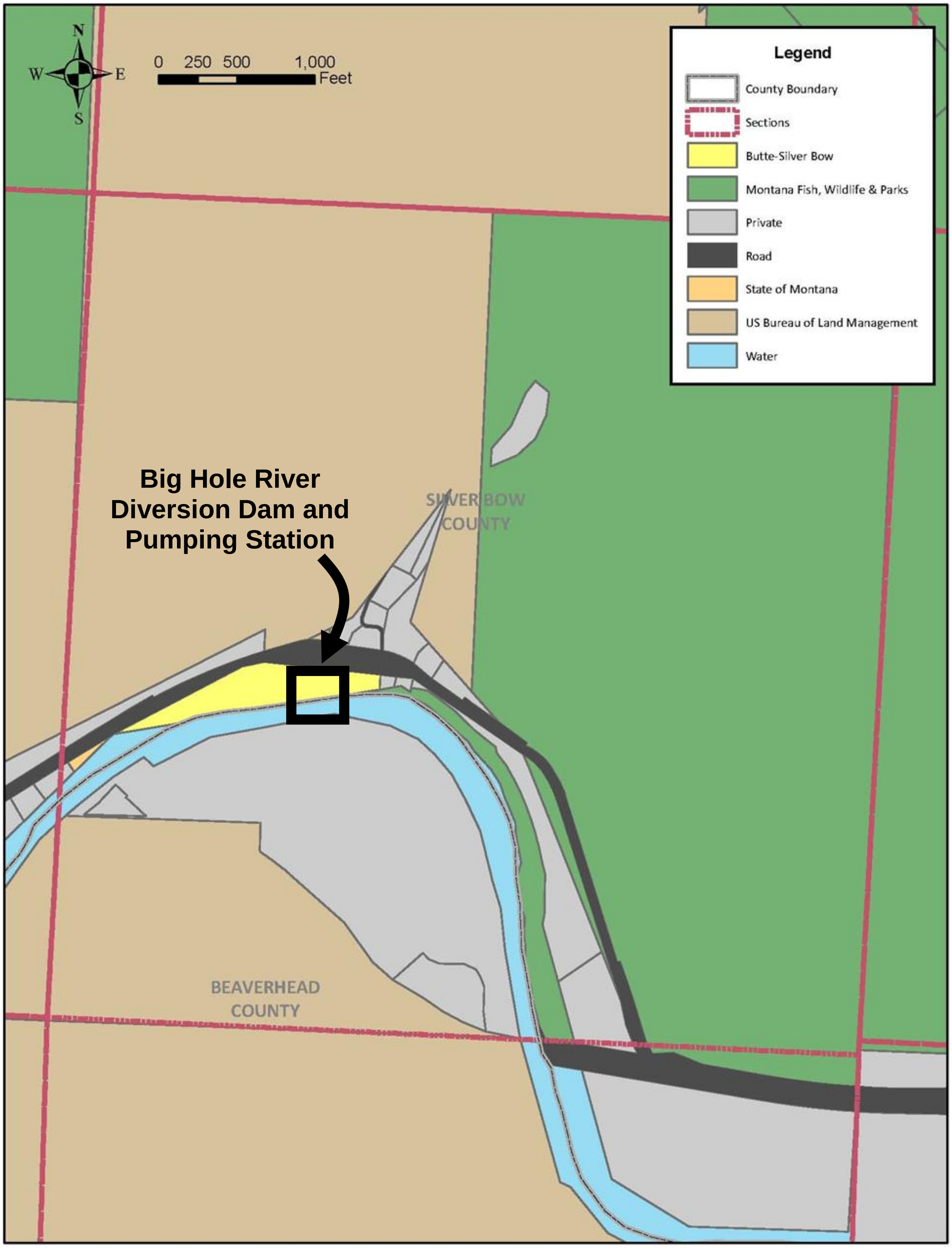
Land use in the immediate vicinity of the existing diversion dam is generally shrubland and grassland, with evergreen forests located in proximity to the project area.

Right-of-Way and Easements

Land near the project site is generally in private, state, or federal ownership. The existing diversion dam and pump house are located on lands owned by BSB. It is anticipated that no new right-of-way would be needed for this project. Figure 3-5 illustrates existing land ownership within the project area.

A search of the FWP website found that the Fleecer Mountain Wildlife Management Area (WMA) is located within close proximity to the existing Big Hole River Diversion Dam. The intent of the WMA is to provide year-round habitat for wildlife, emphasizing winter range for elk and mule deer and to provide public outdoor recreational opportunities. There are no conservation easements or designated wilderness areas within the immediate project area.

Figure 3-5 Land Ownership



Source: NRIS, 2009; DOWL HKM, 2009.

Utilities
The dam, existing pump house, and adjoining facilities are currently served with overhead electrical power and individual propane storage and heaters. Potable water supplies are provided from groundwater wells and sanitary service is provided via individual permitted septic systems. No utility relocations are anticipated for any of the alternatives, although if BSB elects to construct a new pump station, the service point would need to be relocated from the existing pump house to the new pump house.

3.2.2 Historic, Cultural, and Archaeological Resources
The existing Big Hole River diversion dam and associated settling basin are considered contributing resources to the Big Hole Pump Station, which was built in 1899, expanded in 1906, and listed on the National Register of Historic Places (NRHP) in 1980 (Smithsonian Trinomial 24SB257). The existing concrete dam and settling basin, constructed in 1927, replaced the original timber and rock dam located at the site, which was built concurrent with the Pump Station in 1899 and was destroyed by flood in June 1927. Remnants of the original dam are visible in the form of the rock wall on either side of the concrete abutment on the north bank. The Historic Resources Report (Appendix G) contains a full description of the historic, cultural and archaeological resources found within the project area.

Remnants of the original diversion dam, built in 1899, are still evident in the rubble rock retaining wall on the north shore. HRA, 2009.

3.2.3 Noise
Existing noise sources in the project area are from agricultural and recreational activities, traffic on State Highway 43, and birds and animal life. The pump house operations produce minimal noise.

3.2.4 Farmlands
None of the soils identified within the vicinity of the project area are classified as Prime Farmland, Unique Farmland, or Farmlands of Statewide or Local Importance.

3.2.5 Transportation Facilities
Transportation facilities near the project area include Montana State Highway 43, Pump House Road, Charcoal Gulch Road, and several other local access roadways. The existing dam is accessed via Montana Highway 43 and Pump House Road.

3.2.6 Socio-Economic Conditions

Economic Activity
Ranching, agriculture, forestry, and mining activities play a major role in the region. The nearby economic centers of Butte and Dillon support a number of additional industries, including retail, government, construction, education, health care, entertainment, and hospitality services.

Recreation

The Powerhouse Bridge Fishing Access Site (maintained by FWP) and the Divide Bridge Campground (maintained by the Bureau of Land Management [BLM]) are located approximately three miles west of Divide on State Highway 43, or approximately one half mile to the east and west of the existing diversion dam site, respectively. Recreational uses include fishing, boating, camping, picnicking, hiking, and wildlife viewing.

Boaters on the Big Hole River upstream of the existing diversion dam. DOWL HKM, 2009.

Recreational activities on the Big Hole River are restricted during periods of extreme high or low flows. Fishermen and recreational boaters report that the Big Hole River becomes impassable for rafts and boats in the late summer due to low flows. As noted in Section 2.2, 300 cfs was defined as the low flow limit for boat passage; flows below this benchmark are considered insufficient for boating activities. As noted in Chapter 2, all Action Alternatives that include boat and fish bypass channels would be navigable at flow values at or above 300 cfs.

Communities

The town of Divide, Montana is located approximately two miles to the east of the existing dam; no U.S. Census data is available for this community. In 2000, the nine Census blocks immediately adjacent to the project site had a total population of 17 people, all of whom were classified as “white” by the U.S. Census Bureau. Butte is located approximately 25 miles northeast of the existing dam. Butte-Silver Bow is classified as a Consolidated City by the U.S. Census Bureau and had a population of 34,606 in 2000, while Beaverhead County had a population of 9,202.

Risks / Health Hazards

There are two main safety concerns at the existing dam site. As noted in Chapter 1 of this document, BSB personnel often must venture onto the ice in winter months in order to remove ice blockages, placing themselves at risk of injury or drowning. Further, anecdotal evidence suggests that there have been a number of incidents at the diversion dam site in recent years involving boaters becoming trapped in the standing wave that is formed immediately downstream of the dam crest, requiring rescue.

Emergency Response

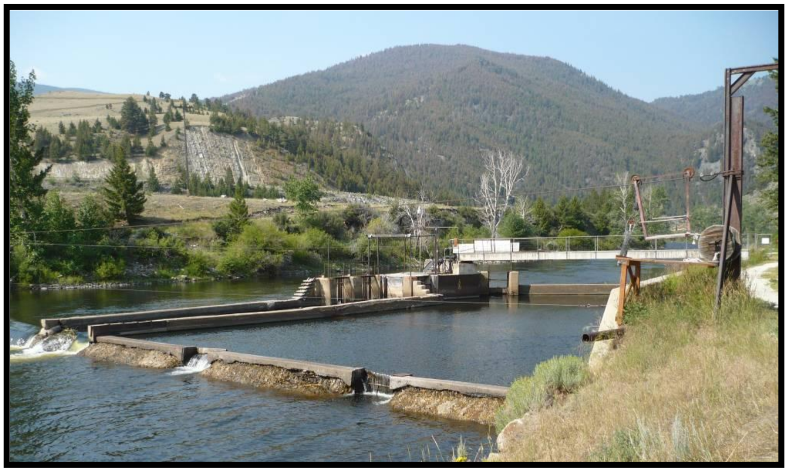
The community of Wise River, located approximately 11 miles west of Divide, provides emergency response services for the area. The nearest hospital is located in Butte. Anecdotal evidence suggests that local residents have historically aided those in immediate danger at the existing dam site.

3.2.7 Hazardous Waste Sites

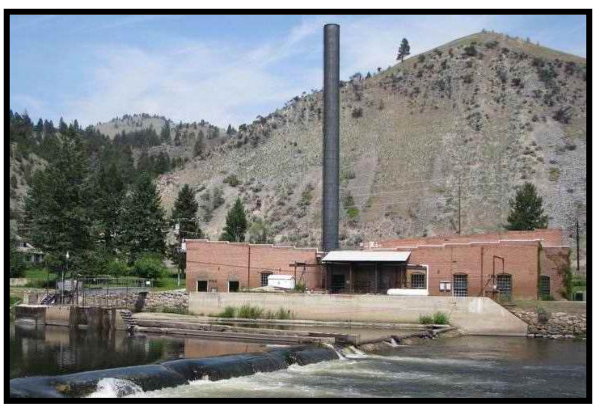
Based on a review of the Natural Resource Information System (NRIS) database, there are no contamination releases, spills, or leaking underground storage tanks within the immediate project area. A Phase I Environmental Site Assessment will not be prepared for this project.

3.2.8 Visual Resources

The proposed project area is located in the Big Hole River canyon. The existing diversion dam spans the width of the Big Hole River, running roughly northeast to southwest. The dam is constructed of reinforced, cast-in-place concrete, with concrete abutment walls along the banks of the river. The existing pump house is constructed of brick and stands on the north bank of the river. As depicted in the photographs below, the diversion dam, pump house, and a riveted metal smoke stack are visible in the foreground, with views of treed hillsides extending in the background. Vegetation lines the river banks, with manicured lawns and mature trees surrounding the pump house facility.



The Big Hole River Diversion Dam, facing southwest. HRA, 2009.



The Big Hole River Diversion Dam, pump house, and riveted metal smoke stack. HRA, 2009.

The Big Hole River Diversion Dam and Pump Station, facing northeast. HRA, 2009.

4.0 Impacts and Mitigation

This chapter contains information on potential social, economic, and environmental resource impacts anticipated to result from each alternative. This information was developed in cooperation with local, state, and federal agencies and members of the general public and is intended to satisfy Montana and National Environmental Policy Act (NEPA/MEPA) requirements.

4.1 Resources Not Affected

It was determined that the Action Alternatives would have no impacts on the following resources:

- Geology
- National Wildlife Refuges, Parks, Preserves, Monuments, and Wild & Scenic Rivers
- Farmlands
- Environmental Justice
- Hazardous Waste Sites

No mitigation would be required for these five resource areas.

4.2 Effects on Natural and Physical Environment

4.2.1 Topography and Soils

Effects of No Action

No effect.

Effects of Action Alternatives

Localized impacts would occur as a result of the Action Alternatives. Under Alternative 2, approximately 0.25 acres would be permanently disturbed within the immediate project area, while approximately one acre would be permanently disturbed under Alternatives 3, 4, and 5. A staging area for equipment and materials occupying approximately 0.5 acres within the arid, upland vegetated area on the terrace to the south of the river would also be temporarily disturbed.

Mitigation for Action Alternatives

Under all proposed Action Alternatives, upland areas temporarily disturbed during project construction and staging activities would be reclaimed and reseeded following project completion. Mitigation for permanent impacts to USACE jurisdictional areas is discussed later in this section.

4.2.2 Vegetation

Effects of No Action

Existing riparian and upland vegetation would not be affected.

Effects of Action Alternatives

Under each of the Action Alternatives, river bank armoring would be needed for structural stability to tie the new structures into the stream banks and to protect new intake systems. The use of rock materials in these locations would result in the permanent removal of riparian vegetation from both the north and south banks of the river, as detailed in Table 4.1.

Table 4.1 Permanent Impacts to Riparian Vegetation

Permanent Impact	Alternative 2		Alternative 3		Alternative 4		Alternative 5	
	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres
Permanent Impact	1,960	0.05	5,619	0.13	5,350	0.12	9,934	0.23

Under Alternative 5, the dam structure would be located further upstream as compared to the other alternatives. The north and south river banks are not currently armored in this upstream location, and therefore Alternative 5 would result in a greater total impacted area.

Under all Action Alternatives, temporary impacts to vegetation would occur within a staging area for equipment and materials. The staging area would occupy approximately 0.5 acres within the arid, upland vegetated area on the terrace to the south of the river.

Mitigation for Action Alternatives

Bioengineered bank treatments have become a viable alternative to the use of large stone and rock structures for stabilizing river banks. Bioengineering techniques aim to use native materials such as soil lifts, biodegradable fabric, and dense vegetation to stabilize eroding banks and to either slow or prevent lateral movement of stream banks. These techniques have been used successfully in many projects across Montana as a softer approach to the traditional use of riprap.

The use of bioengineered banks was considered for Action Alternatives in areas where large rock, stone, and grouted stone is proposed along the banks of the Big Hole River. Upon consideration of these techniques, it was noted that all proposed hardened rock features are designed to permanently secure the structural components of the rock weir and intake pipe walls to the river's bed and banks. It is critically important that each of these structures is permanently secured in place to meet the project's maintenance and operational objectives. As a result, the use of bioengineered river banks in the immediate vicinity of the proposed dam and intake structures was determined an inappropriate technique in these locations. However, bioengineered stabilization in other locations up and downstream of the actual dam and intake structures will be considered in final design. Such applications may be used to protect and enhance the reclaimed stream banks due to construction access, to promote natural re-vegetation of impacted areas, and to minimize flood inundation areas.

Armoring of the north bank has the potential to impact mature cottonwoods. Since this species appears to have a limited amount of advanced regeneration currently present at the site, avoidance of mature cottonwoods is recommended. If impact to the mature vegetation is unavoidable, replanting disturbed vegetation with the same or similar species in the vicinity of the impacts is recommended to minimize habitat disturbance.

Proper reclamation of the staging and borrow pit area following completion of the project would include reseeding and erosion control along access roads. Additionally, as a result of multiple Category 1 weeds present within the project area, efforts would be taken to prevent further spread of these weeds during project construction. Construction activities would comply with the Montana Noxious Weed Control Law (MCA §§ 7-22-2101 through 2154).

4.2.3 Wildlife

Effects of No Action

Existing wildlife habitat would not be affected.

Effects of Action Alternatives

Short-term construction impacts to wildlife would include increased activity and noise in the project area under each of the Action Alternatives. During construction activity, more mobile species such as adult birds and mid-size to large mammals generally move to adjacent habitats to avoid direct mortality from construction activities. Temporary loss of nesting, foraging, and cover habitat may occur from temporary vegetation clearing for construction staging activities.

Permanent impacts to riparian habitat would result from each of the alternatives, as presented in Table 4.1.

Mitigation for Action Alternatives

Mitigation for the removal of riparian vegetation could include offsite riparian enhancement measures such as cottonwood and willow planting or livestock fencing in sensitive riparian areas.

4.2.4 Fisheries

Effects of No Action

Existing fisheries habitat would not be affected. The existing dam would continue to impeded fish passage, reducing access to spawning and rearing habitats.

Effects of Action Alternatives

Alternative 2:

Under this alternative, the new diversion dam would continue to serve as a barrier to fish passage. Alternative 2 would position the new dam approximately 160 feet upstream of the existing dam at an elevation nearly one foot higher than the existing dam. Constructing the new dam upstream of the existing dam would create a backwater pool which would extend further upstream of the current backwater; however, overall pool size and habitat quality would not be affected by moving the dam slightly upstream of its current location.

Replacement of the settling basin with a screened intake may reduce fish losses, as the existing intake structure is not screened to prevent fish entrainment.

Construction activities may temporarily increase turbidity in the Big Hole River, adversely affecting fish.

Alternatives 3, 4, and 5:

Alternatives 3, 4, and 5 would improve fish passage by gradually stepping the drop in water elevation downstream of the new dam structure. This would allow smaller fish to pass over the dam due to shorter jumping heights, as well as reducing the water velocity across the dam crest.

It is understood that “ideal” fish passage occurs when velocities remain below 6 fps, as this represents the approximate sustained speed for the majority of adult fish that are known to exist within the project area. With all Action Alternatives, velocities of less than 6 fps are achieved over the range of typical flows from 200 to 2,000 cfs, with the exceptions of the crest of the upper drop, the upper drop pool, and the crest of the lower drop. It is important to note that these calculated velocities reference a single cross-section and are not representative of velocities along the entire flow path. Although calculated velocities approach 12.5 fps in certain locations, this is still well below the darting velocities of 13 to 14 fps for the fish species located within the project area; further, these higher velocities only occur at river flows in excess of 2,000 cfs. Additional refinement of the final hydraulics will determine the anticipated velocity profiles throughout the reach. A wider opening in the boat and fish channel to further reduce the velocities in these sections may be considered in the final design phase. With a wider opening, the cross-sectional area would be increased, resulting in a lower velocity for the same flow rate.

Fish passage would be improved during all times of the year as a result of improved hydraulics. Providing fish passage would allow trout, grayling, suckers, burbot, and whitefish to freely move throughout this portion of the Big Hole watershed, whereas the existing dam may reduce fish passage to spawning and rearing habitats. The re-establishment of fish passage at the Big Hole Dam is considered a substantial benefit to fish populations utilizing this portion of the watershed.

Under Alternatives 3 and 4, the new dam structure would be set approximately 145 feet upstream of the existing dam. The crest of the new dam would be at nearly the same elevation as the existing dam, and would maintain a backwater pool upstream of the new dam crest. The length of the existing backwater pool would be shortened by 145 feet (approximately 20 percent of the existing pool length), which is equivalent to the distance between the existing dam and the proposed location of the new dam. Alternative 5 would position the nose of the new rock weir dam approximately 630 feet upstream of the existing dam, with a new dam crest approximately 1.1 feet higher than the existing dam crest, creating a backwater pool extending further upstream from the existing backwater pool feature. The increase in crest elevation as compared to the existing dam would maintain equivalent, important habitat upstream of the new dam.

Alternatives 3, 4 and 5 would improve the water intake component of the facility. The intake would be positioned to allow fish and debris to pass the screened intake, reducing the possibility of entrainment.

These alternatives would require placement of grouted rock within the channel. The use of large stone within these areas would create aquatic features which may attract fish due to increased habitat complexity. Conversely, the use of large stone would replace native bed materials which currently provide habitat for macroinvertebrates, a key source of food for fish. Overall, the conversion of native bed materials to large stone, when combined with the creation of fish passage and the new screened intake, is considered a substantial improvement as compared to existing conditions for fish.

As with Alternative 2, construction activities may temporarily increase turbidity in the Big Hole River, adversely affecting fish.

Mitigation for Action Alternatives

Alternatives 3, 4, and 5 would re-establish unrestricted fish passage at the site. This is considered a substantial improvement for fish populations utilizing this portion of the watershed. Unrestricted fish passage would allow fish to easily move upstream of the facility to spawning and rearing sites. Additionally, rock features associated with drop pools would increase habitat complexity, which is also considered a benefit to fisheries. Replacement of the settling basin with new screened intakes would likely prevent fish entrainment and reduce fish losses. Overall, these alternatives would provide improved conditions for fisheries in this portion of the Big Hole River.

Under all alternatives, control measures such as dewatering and/or diverting water away from active construction activity would minimize increases in turbidity. Instream construction timing restrictions would be established in coordination with regulatory agencies through the Clean Water Act (CWA) Section 404 and Stream Protection Act (SPA) 124 regulatory processes.

4.2.5 Water Resources and Water Quality

Effects of No Action
No effect.

Effects of Action Alternatives
The project would have no long-term effects on upstream or downstream surface water or groundwater quantity. Short-term, temporary water quality impacts may occur due to potential increases in turbidity during construction.

As noted in Section 4.2.2, bioengineered streambank stabilization measures may be considered in final design. Such applications may be used to protect and enhance reclaimed stream banks due to construction access, to promote natural re-vegetation of impacted areas, and to minimize flood inundation areas.

Mitigation for Action Alternatives
Water quality impacts would be minimized through the use of controls including dewatering and/or diverting water away from active construction activity and erosion and sediment control measures. Bioengineered streambank stabilization measures will be considered during final design.

4.2.6 Floodplains

Effects of No Action
No effect.

Effects of Action Alternatives
Alternatives 2, 3, and 4 would slightly raise the 100-year water surface elevation at the crest of the proposed dams as compared to existing conditions, while Alternative 5 would slightly lower the water surface elevation. Floodplain impacts are considered negligible due to the relatively minor change in water surface elevations under the proposed Action Alternatives.

Mitigation for Action Alternatives
Measures to reduce water surface elevations and protect structures located within the 100-year floodplain will be considered during final design efforts. These measures may include adjusting the height of various system components and using streambank stabilization techniques, which may also have an added benefit of promoting the growth of wetland and upland vegetative

species. Use of such mitigation measures could result in an improvement over existing conditions.

4.2.7 Wetlands and Other Regulated Areas

Effects of No Action

Existing wetlands and waterways would not be affected. No compensatory mitigation would be required as a result of this alternative.

Effects of Action Alternatives

Alternatives 3, 4, and 5 would result in temporary impacts where sections of pipe would be buried within the delineated boundary of the Big Hole River. This activity would result in the temporary removal of riparian vegetation along the bank during placement of the pipes. Once these intake pipes are buried, the affected area would be re-seeded and vegetation would regenerate along the river bank. Areas of temporary impacts in regulated areas are presented in Table 4.2.

Table 4.2 Temporary Impacts in USACE Regulated Areas

Temporary Impacts	Alternative 2		Alternative 3		Alternative 4		Alternative 5	
	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres
Intake Pipes and Walls	0	0	229	0.01	922	0.02	544	0.01

In addition to these temporary impacts, the Action Alternatives would also result in permanent impacts within regulated Waters of the U.S. These impacts include permanent removal of riparian vegetation along the north and south river banks, placement of fill on an island with emergent riparian vegetation, and placement of fill within the active river bed. None of the proposed options would affect irrigation ditches along either side of the river. All delineated wetland areas lie between the high water mark on each bank of the Big Hole River; no isolated wetlands occur within the project area.

Each of the Action Alternatives would involve removal of the existing diversion dam and settling basin, including the concrete and rock currently spanning the river and the material used to tie the dam into the banks. These areas lie within regulated Waters of the U.S. and therefore can be calculated as on-site mitigation to offset anticipated permanent impacts resulting from project alternatives. The gross and net areas of anticipated permanent impacts resulting from each alternative are presented in Table 4.3.

Table 4.3 Permanent Impacts in USACE Regulated Areas

	Alternative 2		Alternative 3		Alternative 4		Alternative 5	
	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres
A. Gross Permanent Impacts								
North Bank	1,304	0.03	3,155	0.07	2,885	0.07	6,028	0.07
South Bank	656	0.02	2,464	0.06	2,465	0.05	3,906	0.09
Island	0.00	0.00	0.00	0.00	0.00	0.00	2,886	0.07
Riverbed	4,211	0.10	48,665	1.12	49,008	1.13	44,311	1.02
Total	**6,171**	**0.15**	**54,284**	**1.25**	**54,358**	**1.25**	**57,131**	**1.31**
B. Onsite Mitigation								
Removal of Existing Dam	4,165	0.10	4,165	0.10	4,165	0.10	4,165	0.10
Removal of Settling Basin	2,480	0.06	2,480	0.06	2,480	0.06	2,480	0.06
Total	**6,645**	**0.16**	**6,645**	**0.16**	**6,645**	**0.16**	**6,645**	**0.16**
Net Area of Permanent Impacts (A – B)	**(-474)**	**(-0.01)**	**47,639**	**1.09**	**47,713**	**1.09**	**50,486**	**1.15**

Source: Big Hole River Dam and Intake Facility Biological Resources Report, 2009.

Mitigation for Action Alternatives

Permanent project impacts anticipated within regulated areas that exceed the area of on-site mitigation will need additional, off-site mitigation (indicated by the net area of permanent impacts in Table 4.3). Final areas and specific types of mitigation required will be determined in coordination with USACE.

Under Alternative 2 the footprint of the new diversion dam would be smaller than the existing footprint, resulting in a net decrease in impacted area. As a result, no additional compensatory mitigation would be required for this alternative.

For Alternatives 3, 4, and 5, the new footprint would be approximately 1.09 to 1.15 acres larger than the footprint of the existing facilities. Accordingly, mitigation measures beyond removal of the existing structures would likely be required to offset the additional impacts of the proposed structures. If it is determined that on-site mitigation opportunities are limited to the removal of the existing structures, an appropriate off-site mitigation area would need to be identified and developed within the watershed to compensate for proposed impacts resulting from these alternatives.

Wetland mitigation opportunities within the immediate project area are limited by the relatively confined floodplain as the Big Hole River exits the canyon. Compensatory mitigation opportunities within the project area include enhancement of the existing riparian corridor along other portions of the Big Hole River, preservation of the existing riparian areas through a conservation easement, establishment of an upland buffer, construction of a new wetland area, expansion of an existing wetland, or incorporation of project impacts into a wetland mitigation bank. FWP, the U.S. Fish and Wildlife Service (FWS), and the Big Hole Watershed Committee are entities currently involved in many restoration and enhancement projects in the Big Hole Watershed and may be resources for identifying appropriate mitigation projects.

Mitigation ratios are based on the type and timing of compensatory mitigation. Wetland restoration (re-establishment) activities completed prior to any anticipated impacts would follow a 1:1 ratio, meaning that one square foot of compensatory wetlands would be required for each square foot of proposed impact. If mitigation is completed at the same time or after the impact, mitigation ratios vary and may range from 1.5:1 to 5:1, depending on the quality of wetland impacted, the type of compensatory mitigation proposed, and the distance between the impacted wetland and mitigation areas. Negotiations with USACE would be required to determine the actual compensatory mitigation required for the project, as well as determination of whether an Individual or Nationwide Clean Water Act 404 permit would be required.

4.2.8 Air Quality

Effects of No Action
No effect.

Effects of Action Alternatives
Minor and temporary dust and vehicle emissions would be created by heavy equipment during construction, but would end after completion of the project.

Mitigation for Action Alternatives
If necessary, dust control would be implemented by using either water or another approved dust-suppressant.

4.3 Effects on Human Environment

4.3.1 Land Use / Right-of-Way and Easements / Utilities

Effects of No Action
No effect.

Effects of Action Alternatives
No land use impacts are anticipated as a result of this project. None of the Action Alternatives would have a substantive impact on existing recreation opportunities or on the location, distribution, density, or growth rate of the area's population. No new right-of-way would be needed for this project. No utility relocations are anticipated.

Mitigation for Action Alternatives
None required.

4.3.2 Historic, Cultural, and Archaeological Resources

Effects of No Action
The No Action Alternative would have no potential to affect historic resources. While the existing diversion dam would not be removed, continued deterioration of the existing diversion dam structure would likely occur.

Effects of Action Alternatives

Alternatives 2, 3, 4, and 5 would vary substantially from the design of the existing dam and waterworks, and would necessitate the complete removal of the existing diversion dam, intake structure, settling basin, cistern, rock retaining walls, and piping. These alternatives would not be classifiable as a preservation treatment, as defined by the National Park Service in the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. Removal of the existing dam may constitute an adverse effect, which would likely require mitigation. In addition, new piping and other new construction would impact the Big Hole Pump Station, a historic property listed on the NRHP.

Phase II of Alternative 3 would incorporate construction of a new pump station, relocating existing water conveyance functions from the historic Big Hole pump station. This aspect may allow for easier public access to, and preservation of, the historic resource; however, it would alter the primary use of the facility from a pump station, which may be considered an adverse effect and would likely require mitigation.

It should be noted that all proposed Action Alternatives would require ground-disturbing activities. As with any involving ground-disturbing activities, there is a possibility of encountering archaeological resources. During a pedestrian survey of the site, architectural historians encountered a trash scatter of bricks, worked stone, and concrete upstream of the pump station along the north bank. Ground disturbing activities may encounter archaeological evidence from the initial construction of the Big Hole Pump Station (1899), the subsequent addition (1906), the extant dam (1929), and possible foundation remains from outbuildings at the site that have since been removed. Because the site is located at a river, the chance of encountering prehistoric archaeological resources is probable.

Mitigation for Action Alternatives

All Action Alternatives would include removal of the existing diversion dam in its entirety, including various associated components, which would constitute an adverse effect. Phase II of Alternative 3 would also involve construction of a new pump house, altering the primary use of the existing facility, which may be considered an adverse effect. Accordingly, appropriate consultation with the Montana State Historic Preservation Office (SHPO) and other stakeholders would be required to determine which mitigation measures should be undertaken. Mitigation measures to be considered include:

- Historic American Engineering Record (HAER) recordation (Level II).
- Interpretation and education (e.g., install signs or salvaged components at the BSB Public Works Department office or a city park; print a brochure or small pamphlet telling the history of the project; develop a brief documentary film and post it on the BSB website).
- Mitigation through "positive effects" on an historic resource, specifically restoration of the Big Hole Pump Station building. Appropriate mitigation of the Big Hole Pump Station could be limited to exterior character-defining features. This may include re-pointing and repair to structural brick and masonry on the building and smoke stack, and restoration of window and door openings, where appropriate.

In the event that archaeological resources are discovered during construction, appropriate mitigation measures should be followed to ensure their identification, evaluation, and disposition. BSB should assess the site, in conjunction with a qualified archaeologist and in consultation with SHPO, regarding the nature and condition of the discovered item(s). All construction activity should be suspended until the site is handled properly, and in accordance with state and federal laws.

4.3.3 Noise

Effects of No Action
No effect.

Effects of Action Alternatives
Noise levels would increase temporarily during the construction period for each of the Action Alternatives. The increased noise would end upon completion of the project.

Mitigation for Action Alternatives
The project's contractor would be subject to all state and local laws to minimize construction noise by having mufflers on all equipment.

4.3.4 Transportation Facilities

Effects of No Action
No effect.

Effects of Action Alternatives
All proposed Action Alternatives would result in increased construction-related traffic on State Highway 43.

Mitigation for Action Alternatives
The project's contractor would be subject to all state and local laws to minimize construction noise by having mufflers on all equipment. Dust control would also be implemented by using either water or another approved dust-suppressant. Traffic interruptions would be minimized to the extent possible using appropriate traffic control measures.

4.3.5 Socio-Economic Conditions

Effects of No Action
The dam would continue to deteriorate over time; failure of the dam would adversely affect the residential and commercial water users dependent on the Big Hole River as a source of potable water, resulting in negative effects to the health, safety, and economic activity of the Butte population.

Additionally, the existing dam would remain a safety hazard for boaters and maintenance personnel.

Effects of Action Alternatives
All proposed Action Alternatives would improve safety for maintenance personnel by reducing icing problems at the facility. Action Alternatives would also improve boater safety at the site, potentially reducing the ongoing need for emergency response services. Recreational activities on this portion of the Big Hole River would be enhanced due to the safety improvements

included in the design of the new diversion structure. The dangerous "keeper wave" would be eliminated under these alternatives.

Additionally, under Alternatives 3, 4, and 5, boating passage would also be enhanced due to the design of the chute through the middle of the rock weir. This chute would allow boat passage at the facility during periods of low flow even when other portions of the Big Hole River would be non-navigable due to the shallow depth associated with the natural terrain. At flows of 300 cfs and above, the spillway width would allow boaters to float through with oars extended; boaters would not experience any inconvenience while passing through the spillway.

Under Alternatives 3 and 4, fishing opportunities would be enhanced through the likely creation of a new pool upstream of the existing dam. Alternative 5 would also create a new pool, but would impact the existing pool.

The Action Alternatives would result in a positive effect on economic activity and employment in the region. The project itself may result in short-term construction-related employment opportunities, while a new diversion structure would ensure continued economic vitality for the Butte area.

Mitigation
None required.

4.3.6 Visual Resources

Effects of No Action
The existing concrete diversion dam would continue to span the Big Hole River. No new visual impacts would result.

Effects of Action Alternatives
Under Alternative 2, a new structure similar in size and material would be constructed in the same location as the existing dam. There would be minimal new visual impacts as compared to existing conditions.

Alternatives 3, 4, and 5 would involve removal of the existing dam in its entirety and construction of a rock weir dam using native materials. Under these alternatives, the proposed structures would be visible during low flows, but would better blend into the surroundings as compared to the existing concrete structure. During periods of high flow, the river would overtop the structures, resulting in no visual impact.

With all Action Alternatives, there would be temporary visual impacts resulting from clearing of vegetation.

Mitigation for Action Alternatives
No new visual impacts would result under Alternative 2. Under Alternatives 3, 4, and 5, there would be a net positive visual impact due to the use of native construction materials as compared to the concrete structures currently in place. Under all Action Alternatives, disturbed areas would be reseeded with desirable vegetation.

4.4 Cumulative Effects

While Sections 4.2 and 4.3 disclosed individual impacts resulting exclusively from the proposed project, this section considers the cumulative effects of this project in addition to other past, present, and reasonably foreseeable future projects noted below.

Past Projects

- Construction of the existing diversion dam
- Maintenance activities associated with the existing diversion dam (see full accounting in Appendix B)

Present Projects

- None known (apart from proposed project)

Reasonably Foreseeable Projects

- Continued replacement of deteriorated transmission piping

Past Projects: Effects of No Action

The No Action Alternative would leave the existing diversion dam in place. This structure would continue to impede fish and boater passage. Debris and sediment would continue to accumulate along the entire width of the dam, requiring routine and periodic maintenance by BSB. Due to unabated icing problems at the site, maintenance personnel would continue to work in unsafe conditions. Over time, the dam would continue to deteriorate, posing an increasing risk of failure. Should the dam fail, the Butte service area would lose a major source of potable water, which could negatively affect human health and welfare in addition to economic activity in the Butte area. In the event of dam failure, a full emergency repair would difficult, costly, and would negatively impact the water customers in Butte.

Present Projects: Effects of Action Alternatives

Under Alternative 2, the existing diversion dam would be replaced with a structure nearly identical in size and location. It would largely continue to function as before, and would continue to impede fish and boater passage, although boater safety would be improved through elimination of the "keeper wave." Safety for maintenance personnel would be improved with the relocation of the intake structure from the middle of the river to the north bank and simplification of the operating protocols. The new structure would eliminate the risk of failure and would provide a reliable source of water for Butte. Under Alternatives 3, 4, and 5, the existing diversion dam would be replaced with a new rock weir dam constructed of native materials. These alternatives would provide the benefits noted under Alternative 2, in addition to improved boat and fish passage.

Under all of the proposed Action Alternatives, repair or replacement of the existing diversion dam would guarantee reliable water delivery to Butte, and thereby encourage continued economic growth and development in the Butte area. The proposed project would also have a positive cumulative effect on safety at the site for both maintenance personnel and for boaters and recreationalists. The proposed project would not induce land use changes or promote unplanned growth in the immediate project area; no new developments or new land uses are anticipated within the immediate vicinity as a result of this project.

Reasonably Foreseeable Projects

BSB intends to continue to replace old, leaking water transmission lines throughout the Butte water system as funding allows, improving the efficiency and reliability of water delivery and resulting in a positive cumulative effect on Butte water users. There are no other known projects planned for the foreseeable future within 10 miles of the diversion dam site that would contribute to cumulative impacts when considered in conjunction with the proposed project.

4.5 Summary of Impacts

Table 4.4 summarizes impacts and associated mitigation commitments for each alternative.

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Table 4.4 Summary of Impacts and Mitigation Commitments

Resource Area	Alternative 1: No Action		Alternative 2: Replace in Kind		Alternative 3: Rock Weir and New Pump House		Alternative 4: Rock Weir with Floating Intake		Alternative 5: Upstream Rock Weir	
	Impact	Mitigation	Impact	Mitigation	Impact	Mitigation	Impact	Mitigation	Impact	Mitigation
Topography & Soils	No effect	None required	Permanent impact of 0.25 acres; temporary impact of 0.5 acres for staging area	Reclamation and reseeding for areas temporarily impacted; mitigation for permanent impacts to jurisdictional areas to be determined in coordination with USACE	Permanent impact of 1.0 acres; temporary impact of 0.5 acres for staging area	Reclamation and reseeding for areas temporarily impacted; mitigation for permanent impacts to jurisdictional areas to be determined in coordination with USACE	Permanent impact of 1.0 acres; temporary impact of 0.5 acres for staging area	Reclamation and reseeding for areas temporarily impacted; mitigation for permanent impacts to jurisdictional areas to be determined in coordination with USACE	Permanent impact of 1.0 acres; temporary impact of 0.5 acres for staging area	Reclamation and reseeding for areas temporarily impacted; mitigation for permanent impacts to jurisdictional areas to be determined in coordination with USACE
Vegetation	No effect	None required	Permanent impact of 0.05 acres; temporary impact of 0.5 acres for staging area	Consider use of bioengineered streambank stabilization; utilize reclamation, reseeding, and erosion control measures	Permanent impact of 1.0 acres; temporary impact of 0.13 acres for staging area	Consider use of bioengineered streambank stabilization; utilize reclamation, reseeding, and erosion control measures	Permanent impact of 1.0 acres; temporary impact of 0.12 acres for staging area	Consider use of bioengineered streambank stabilization; utilize reclamation, reseeding, and erosion control measures	Permanent impact of 0.23 acres; temporary impact of 0.5 acres for staging area	Consider use of bioengineered streambank stabilization; utilize reclamation, reseeding, and erosion control measures
Wildlife	No effect	None required	Short-term construction impacts including increased activity and noise in the project area; temporary loss of nesting, foraging, and cover habitat	Minimize noise and utilize offsite riparian enhancement measures	Short-term construction impacts including increased activity and noise in the project area; temporary loss of nesting, foraging, and cover habitat	Minimize noise and utilize offsite riparian enhancement measures	Short-term construction impacts including increased activity and noise in the project area; temporary loss of nesting, foraging, and cover habitat	Minimize noise and utilize offsite riparian enhancement measures	Short-term construction impacts including increased activity and noise in the project area; temporary loss of nesting, foraging, and cover habitat	Minimize noise and utilize offsite riparian enhancement measures
Fisheries	Existing dam would continue to impede fish passage	None required	New dam would continue to impeded fish passage; screened intake may reduce fish losses; project may temporarily increase in turbidity	Utilize control measures to minimize increases in turbidity; coordinate with regulatory agencies regarding instream construction timing	Rock weir would improve fish passage; screened intake may reduce fish losses; project may temporarily increase in turbidity	Utilize control measures to minimize increases in turbidity; coordinate with regulatory agencies regarding instream construction timing	Rock weir would improve fish passage; screened intake may reduce fish losses; project may temporarily increase in turbidity	Utilize control measures to minimize increases in turbidity; coordinate with regulatory agencies regarding instream construction timing	Rock weir would improve fish passage; screened intake may reduce fish losses; project may temporarily increase in turbidity	Utilize control measures to minimize increases in turbidity; coordinate with regulatory agencies regarding instream construction timing

Resource Area	Alternative 1: No Action		Alternative 2: Replace in Kind		Alternative 3: Rock Weir and New Pump House		Alternative 4: Rock Weir with Floating Intake		Alternative 5: Upstream Rock Weir	
	Impact	Mitigation	Impact	Mitigation	Impact	Mitigation	Impact	Mitigation	Impact	Mitigation
Water Resources and Water Quality	No effect	None required	Short-term, temporary water quality impacts may occur	Utilize control measures to minimize increases in turbidity; consider bioengineered stabilization measures to protect reclaimed stream banks	Short-term, temporary water quality impacts may occur	Utilize control measures to minimize increases in turbidity; consider bioengineered stabilization measures to protect reclaimed stream banks	Short-term, temporary water quality impacts may occur	Utilize control measures to minimize increases in turbidity; consider bioengineered stabilization measures to protect reclaimed stream banks	Short-term, temporary water quality impacts may occur	Utilize control measures to minimize increases in turbidity; consider bioengineered stabilization measures to protect reclaimed stream banks
Floodplains	No effect	None required	Slight increase in water surface elevation during 100-year flood event	Consider measures to reduce water surface elevations and protect structures, including adjusting the height of various system components and using streambank stabilization techniques	Slight increase in water surface elevation during 100-year flood event	Consider measures to reduce water surface elevations and protect structures, including adjusting the height of various system components and using streambank stabilization techniques	Slight increase in water surface elevation during 100-year flood event	Consider measures to reduce water surface elevations and protect structures, including adjusting the height of various system components and using streambank stabilization techniques	Slight decrease in water surface elevation during 100-year flood event	None required
Wetlands and Other Regulated Areas	No effect	None required	Net decrease in impacted area	None required	Temporary impact of 0.01 acres; Permanent impact of 1.09 acres	On-site or off-site mitigation would be required; final areas and specific types of mitigation to be determined in coordination with USACE	Temporary impact of 0.02 acres; Permanent impact of 1.09 acres	On-site or off-site mitigation would be required; final areas and specific types of mitigation to be determined in coordination with USACE	Temporary impact of 0.01 acres; Permanent impact of 1.15 acres	On-site or off-site mitigation would be required; final areas and specific types of mitigation to be determined in coordination with USACE
Air Quality	No effect	None required	Minor and temporary dust and vehicle emissions	If necessary, dust control measures would be implemented	Minor and temporary dust and vehicle emissions	If necessary, dust control measures would be implemented	Minor and temporary dust and vehicle emissions	If necessary, dust control measures would be implemented	Minor and temporary dust and vehicle emissions	If necessary, dust control measures would be implemented
Land Use / Right-of-Way and Easements / Utilities	No effect	None required	No effect	None required	No effect	None required	No effect	None required	No effect	None required

Resource Area	Alternative 1: No Action		Alternative 2: Replace in Kind		Alternative 3: Rock Weir and New Pump House		Alternative 4: Rock Weir with Floating Intake		Alternative 5: Upstream Rock Weir	
	Impact	Mitigation	Impact	Mitigation	Impact	Mitigation	Impact	Mitigation	Impact	Mitigation
Historic, Cultural, and Archaeological Resources	Continued deterioration of the diversion dam structure	None required	Complete removal of the existing diversion dam, intake structure, settling basin, rock retaining walls, and piping; new piping into existing pump house	Historic American Engineering Record (HAER) recordation (Level II); interpretation and education; mitigation through "positive effects" (i.e., restoration of existing pump house)	Complete removal of the existing diversion dam, intake structure, settling basin, rock retaining walls, and piping; new piping into existing pump house; construction of new pump house in Phase II	Historic American Engineering Record (HAER) recordation (Level II); interpretation and education; mitigation through "positive effects" (i.e., restoration of existing pump house)	Complete removal of the existing diversion dam, intake structure, settling basin, rock retaining walls, and piping; new piping into existing pump house	Historic American Engineering Record (HAER) recordation (Level II); interpretation and education; mitigation through "positive effects" (i.e., restoration of existing pump house)	Complete removal of the existing diversion dam, intake structure, settling basin, rock retaining walls, and piping; new piping into existing pump house	Historic American Engineering Record (HAER) recordation (Level II); interpretation and education; mitigation through "positive effects" (i.e., restoration of existing pump house)
Noise	No effect	None required	Temporary increase in noise during construction	Minimize construction noise by having mufflers on all equipment	Temporary increase in noise during construction	Minimize construction noise by having mufflers on all equipment	Temporary increase in noise during construction	Minimize construction noise by having mufflers on all equipment	Temporary increase in noise during construction	Minimize construction noise by having mufflers on all equipment
Transportation Facilities	No effect	None required	Temporary increase in construction-related traffic	Utilize measures to minimize dust, noise, and traffic interruptions	Temporary increase in construction-related traffic	Utilize measures to minimize dust, noise, and traffic interruptions	Temporary increase in construction-related traffic	Utilize measures to minimize dust, noise, and traffic interruptions	Temporary increase in construction-related traffic	Utilize measures to minimize dust, noise, and traffic interruptions
Socio-Economic Conditions	No effect	None required	Improved safety for maintenance personnel and recreational users; enhanced economic activity and employment in region	None required	Improved safety for maintenance personnel and recreational users; enhanced boating and fishing opportunities; enhanced economic activity and employment in region	None required	Improved safety for maintenance personnel and recreational users; enhanced boating and fishing opportunities; enhanced economic activity and employment in region	None required	Improved safety for maintenance personnel and recreational users; enhanced boating opportunities; enhanced economic activity and employment in region	None required
Visual Resources	No effect	None required	Minimal new visual impacts	None required	Rock weir would be visible during low flows, but would better blend into the surroundings; during periods of high flow, the river would overtop the weir resulting in no visual impact.	None required	Rock weir would be visible during low flows, but would better blend into the surroundings; during periods of high flow, the river would overtop the weir resulting in no visual impact.	None required	Rock weir would be visible during low flows, but would better blend into the surroundings; during periods of high flow, the river would overtop the weir resulting in no visual impact.	None required

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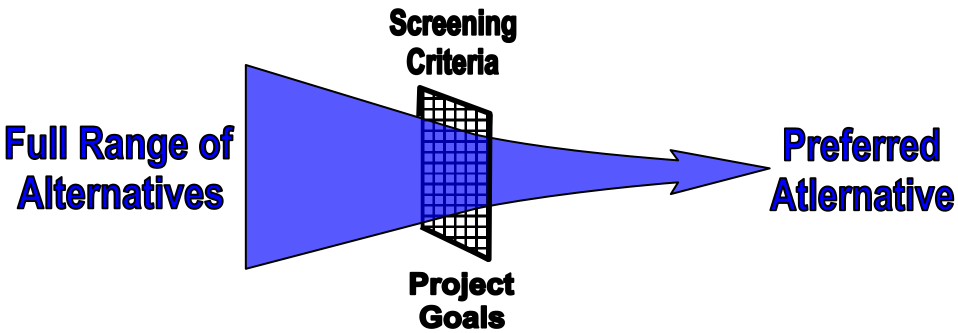
5.0 Alternatives Evaluation and Selection of Preferred Alternative

5.1 Evaluation of Alternatives

This section describes how the broad range of initial alternatives was evaluated using a set of defined Screening Criteria. As noted in Section 1.5, project goals were developed to aid in evaluation of the proposed project alternatives and selection of the Preferred Alternative. As illustrated in Figure 5-1, alternatives were assessed to determine their ability to meet project goals. Based on its ability to best meet project goals, the Preferred Alternatives is presented at the end of this chapter. It should be noted that project goals are not listed in order of importance. For purposes of clarity, Alternative 1 is considered the No Action Alternative and Alternatives 2, 3, 4 and 5 are considered Action Alternatives.

Figure 5-1 Alternatives Screening Process



Goal 1: Provide a Reliable Source of Water for BSB Service Area

The No Action Alternative would not provide any improvement to existing conditions and therefore does not meet Goal 1. It is carried forward, however, as a baseline for comparative analysis and as a viable option if the impacts of the proposed project appear to outweigh the benefits.

All proposed Action Alternatives would provide a more reliable diversion system than currently exists. Under Alternatives 2, 3, and 5, the new intake system would use either a butterfly valve or an Obermeyer gate valve, and would provide operational flexibility to enable maximum system performance during variable river flows, weather conditions, and raw water demands, allowing adequate diversion, clearing of screens, and passage of ice and debris. Alternative 4 would utilize an intake system with River Tee screens designed to maximize suction head for the existing pumps, although the intake may be vulnerable to damage from debris moving downstream during large flow events.

All Action Alternatives would provide a secondary intake system, which does not currently exist. This is considered an important benefit because it would ensure continued service should the primary intake system fail or require maintenance.

Under Alternative 2, the concrete dam would be durable and long-lasting. The downstream toe would be protected with concrete rubble and a layer of native angular rock would protect the intake against erosion and scour. The rock weirs in alternatives 3, 4, and 5 are designed to be reliable and self-maintaining. The combined rock and grout used for the weirs provide an extremely durable material that can withstand hydraulic forces, erosion and scour, and freeze-thaw damage.

As noted in Section 2.2, all four Action Alternatives were designed to meet minimum function requirements, and therefore meet Goal 1.

Goal 2: Reduce Maintenance Requirements

The No Action Alternative would not provide any improvement over existing conditions and therefore does not meet Goal 2.

Alternatives 2, 3, and 5 would reduce the formation of ice by allowing water to continuously flow through the new intake structure during winter months with velocities sufficient to sluice ice and maintain submergence on the intake screens. These closed intake structures can also be fitted with air bubbler systems to minimize ice buildup. Additionally, these new intake structures would also have sufficient flow velocities to flush debris and sediment accumulations. These factors would greatly reduce the ice buildup, thereby reducing maintenance requirements for BSB personnel. Alternative 4 involves submerging the intake screens in an upstream pool well beneath any potential ice buildup.

Alternatives 3, 4, and 5 incorporate a stepped grouted rock weir with a minimal application of gates and stop logs for flow management. This simplified design of the new dam would reduce required operator interface and future maintenance.

Alternatives 2, 3, and 5 would also optimize debris handling and sediment flushing. A debris boom would collect surface debris at the site, while a gate system would allow screen flushing as needed based on flow conditions. Under Alternative 4, the intake system would be submerged under all flows, negating the need for debris handling and sediment flushing.

In addition, the construction of new facilities would inherently reduce the amount of required routine maintenance.

While the intake system would be located along the river bank under Alternatives 2, 3, and 5, Alternative 4 would involve instream intake system components. These components would be vulnerable to damage by trash and debris during high flow events. Further, these system components are designed to float in a natural pool upstream of the existing dam; it is not clear how the new rock weir structure would affect future scour patterns in the riverbed. Over time, sedimentation may fill in this pool, negating the advantage of a floating intake system.

All four Action Alternatives meet Goal 2, although Alternative 4 may not be as effective at meeting this goal as compared to Alternatives 2, 3, and 5.

Goal 3: Reduce Icing Problems

The No Action Alternative would not provide any improvement over existing conditions and therefore does not meet Goal 3.

As noted previously, all Action Alternatives would reduce the formation of ice and therefore all Action Alternatives meet Goal 3.

Goal 4: Improve Fish Passage

The No Action Alternative would not provide any improvement over existing conditions and therefore does not meet Goal 4.

As documented in Chapter 4, Alternative 2 would continue to impede fish passage, limiting access to important spawning and rearing habitats, and therefore fails to meet Goal 4.

Alternatives 3, 4, and 5 would provide improved fish passage through the use of notched weirs and the installation of a fish passage channel with rest pools. Providing fish passage would allow trout, grayling, suckers, burbot, and whitefish to freely move throughout this portion of the Big Hole watershed. The re-establishment of fish passage at the Big Hole Dam is considered a substantial benefit to fish populations utilizing this portion of the watershed. These alternatives pass Goal 4.

Goal 5: Improve Boat Passage Safety

The No Action Alternative would not provide any improvement over existing conditions and therefore does not meet Goal 5.

Spring 2009 runoff conditions illustrating keeper wave at the existing diversion dam. WHPacific, 2009.

Under Alternative 2, the design of the concrete dam would include a stepped dam face to eliminate the keeper wave that currently exists, thereby improving boater safety. Alternative 2 would not improve boat passage, however, and therefore fails to meet Goal 5.

In addition to a stepped rock face that would eliminate the existing keeper wave, Alternatives 3, 4 and 5 would provide improved boat passage at the site through the use of notched weirs in the rock dam and the installation of a boat passage channel with rest pools. The spillway would be designed to minimize boater inconvenience and optimize boat passage even during periods of low flows when other stretches of the river would be non-navigable. These three alternatives pass Goal 5.

Goal 6: Minimize Impacts to Environmental Resources

The No Action Alternative would not involve any new impacts to environmental resources.

Although Alternative 2 would not involve placement of additional fill material in the river, it would continue to impede fish passage. As documented in Chapter 4, Alternative 2 would prevent fish access to important spawning and rearing habitats. Accordingly, Alternative 2 fails to meet Goal 6.

Alternatives 3, 4, and 5 would all provide improved fish passage through the use of a notched rock weir design and the installation of a fish passage channel with rest pools. As noted previously, the re-establishment of fish passage at the Big Hole Dam is considered a substantial benefit to fish populations utilizing this portion of the watershed.

Of the four proposed Action Alternatives, Alternative 3 is considered the least impactful as its entire footprint is located within the historical footprint of the existing dam. It would provide fish passage and would require the least amount of new fill in the river. This alternative best meets Goal 6, while Alternatives 2, 4, and 5 are less favorable with more impact, larger footprints and more fill in the river.

Goal 7: Improve Safety for Maintenance Personnel

The No Action Alternative would not provide any improvement to existing conditions and therefore does not meet Goal 7.

As noted previously, all Action Alternatives would reduce the formation of ice. Maintenance personnel would no longer need to venture onto the ice to maintain flow to the intake system, thereby eliminating the risk of personal injury. Alternatives 2, 3, and 5 would further improve safety by relocating the intake structure along the north shore of the Big Hole River as opposed to the current instream location, which would greatly improve access and safety should BSB operators be required to conduct work or maintenance on the structure. All Action Alternatives meet Goal 7.

Goal 8: Minimize Project Costs

The No Action Alternative would only involve costs related to the preliminary design and environmental compliance efforts conducted to date, and would not involve any construction costs. It should be noted, however, that without reconstruction or major rehabilitation of the existing facility, costly emergency repairs would likely be needed on a continuing basis. Due to its low cost, this alternative meets Goal 8.

Alternatives 2, 3, 4, and 5 are considered moderately costly, ranging from $4.0 to $9.5 million. All Action Alternatives meet Goal 8. It should be noted that the second phase of Alternative 3 would cost approximately $4.4 million are considered separately; construction of Phase II is dependent on future funding availability.

Table 5.1 has been prepared to summarize the analysis of the five different alternatives against the eight project goals in matrix form. Each alternative was either given a “pass” or “fail” when analyzed against each specific project goal. “Passing” grades were assigned a value of 1, while “failing” grades were given a value of 0. The highest score reflects the alternative best meeting the project goals.

Table 5.1 Summary of Screening Process

Screen Component	Alternatives				
	One: No Action	**Two: Replace in Kind**	**Three: New Rock Weir Dam, Intake and Pump Station**	**Four: New Rock Weir Dam and Submerged Upstream Intake**	**Five: New Upstream Rock Weir Dam and Intake**
Goal 1: Provide a reliable source of potable water for the BSB service area	No improvement over existing conditions; system failure or malfunction is expected at any time **Score = 0**	New dam and intake structure would improve reliability of water diversion by increasing the ability to modulate flow and upstream water levels via the intake control system. This would enable flushing the intake works, reduction in ice buildup and frazzle ice accumulation, improved debris handling, and increased operator safety. **Score = 1**	New dam and intake structure would improve reliability of water diversion by increasing the ability to modulate flow and upstream water levels via the intake control system. This would enable flushing the intake works, reduction in ice buildup and frazzle ice accumulation, improved debris handling, and increased operator safety. Phase II would involve construction of a new pump house, thereby improving reliability of the raw water delivery system. **Score = 1**	New submerged intake structure would improve reliability of water diversion by locating the intakes below the ice levels and in the deeper upstream pool. This alternative also provides increased upstream water surface levels and increased suction head on existing pumps. **Score = 1**	New upstream dam and intake structure would improve reliability of water diversion by increasing the ability to modulate flow and upstream water levels via the intake control system. This would enable flushing the intake works, reduction in ice buildup and frazzle ice accumulation, improved debris handling, and increased operator safety. This alternative also provides for increased upstream water surface levels and increased suction head on existing pumps. **Score = 1**
Goal 2: Reduce maintenance requirements	No improvement over existing conditions; intensive maintenance requirements would be ongoing **Score = 0**	Reduced level of required maintenance due to new facilities and simplified operations with minimal application of flow control gates and stop logs. **Score = 1**	Reduced level of required maintenance due to new facilities and simplified operations with minimal application of flow control gates and stop logs. **Score = 1**	Reduced level of required maintenance due to new facilities and simplified operations with minimal application of flow control gates and stop logs. **Score = 1**	Reduced level of required maintenance due to new facilities and simplified operations with minimal application of flow control gates and stop logs. **Score = 1**
Goal 3: Reduce icing problems	No improvement over existing conditions; ice formation would continue to pose problems for system functionality **Score = 0**	Design would minimize icing through increased sluicing velocities and application of air bubbler systems **Score = 1**	Design would minimize icing through increased sluicing velocities and application of air bubbler systems. **Score = 1**	Design would minimize icing by submerging intake screens below ice levels in the river **Score = 1**	Design would minimize icing through increased sluicing velocities and application of air bubbler systems **Score = 1**
Goal 4: Improve fish passage	No improvement over existing conditions; fish passage would continue to be impeded **Score = 0**	New facility would not provide fish passage **Score = 0**	Notched weir design with fish passage channel and rest pools would enable unrestricted fish passage **Score = 1**	Notched weir design with fish passage channel and rest pools would enable unrestricted fish passage **Score = 1**	Notched weir design with fish passage channel and rest pools would enable unrestricted fish passage **Score = 1**
Goal 5: Improve boat passage	No improvement over existing conditions; "keeper wave" would continue to pose safety risk for boaters **Score = 0**	While "keeper wave would be eliminated, new facility would not provide boat passage **Score = 0**	Notched weir design with boat passage channel and rest pools would provide safe boat passage **Score = 1**	Notched weir design with boat passage channel and rest pools would provide safe boat passage **Score = 1**	Notched weir design with boat passage channel and rest pools would provide safe boat passage **Score = 1**
Goal 6: Minimize impacts to environmental resources	No new impacts **Score = 1**	This alternative would remove existing dam and replace with new structure that would inhibit fish passage. New dam and intake would be outside the historical footprint and would require a point of diversion change. **Score = 0**	This alternative would remove existing dam structure. The new structure footprint is located within the historical footprint and requires the least amount of new fill in the river of the three alternatives providing fish passage. Alternative would not require a point of diversion change **Score = 1**	Alternative would remove existing dam, but require new fill material for rock weir located well outside the historical footprint. This alternative would require a change in the point of diversion **Score = 0**	Alternative would remove existing dam, but require new fill material for rock weir located well outside the historical footprint. This alternative would require a change in the point of diversion **Score = 0**
Goal 7: Improve safety for maintenance personnel	No improvement over existing conditions; maintenance personnel would continue to risk personnel injury when maintaining existing system **Score = 0**	Design would improve safety for maintenance personnel through reduced ice removal efforts. Intake would be located adjacent to north bank, and would not require access to the middle of the river. **Score = 1**	Design would improve safety for maintenance personnel through reduced ice removal efforts. Intake would be located adjacent to north bank, and would not require access to the middle of the river. **Score = 1**	Design would improve safety for maintenance personnel through reduced ice removal efforts due to the submerged intake design. **Score = 1**	Design would improve safety for maintenance personnel through reduced ice removal efforts. Intake would be located adjacent to north bank, and would not require access to the middle of the river. **Score = 1**
Goal 8: Minimize total project costs*	Low cost ($0.5 million) **Score = 1**	Moderate cost ($4.0 million) **Score = 1**	High total cost ($9.5 million), but moderate cost for Phase I ($5.1 million)** **Score = 1**	Moderate cost ($5.3 million) **Score = 1**	Moderate cost ($5.3 million) **Score = 1**
Alternative Screening Score	**2**	**5**	**8**	**7**	**7**

Note: Red text indicates failure to meet screen component; blue text indicates ability to meet screen component.
*Estimates include costs associated with design, environmental compliance and permitting, and construction.
**Phase II would cost approximately $4.4 million; construction of Phase II is dependent on funding availability.

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Preferred Alternative

As discussed in this section and as shown in Table 5.1, Alternative 3 is the only proposed Action Alternative able to meet all of the Project Goals. Phase I of Alternative 3 would ensure improved system reliability, reduced maintenance and icing problems, improved safety, and improved fish and boat passage. Alternative 3 would not require a permit for a change in point of diversion, eliminating the need for a potentially lengthy permitting process and the risk of re-adjudication of BSB's existing water right. Additionally, of the alternatives providing fish and boat passage, Phase I of Alternative 3 would require the least amount of new fill material in the Big Hole River and would be the least costly. Lastly, the second phase of Alternative 3 would provide an additional operational benefit over other alternatives through construction of a new pump house, which would enable the placement of new or existing pumps at proper elevations to eliminate pump cavitation. Because Alternative 3 is best able to meet the Purpose and Need and the Project Goals, it has been identified as the Preferred Alternative.

Design Options and Other Refinements

As noted in prior discussions, refinements will likely be made to the Preferred Alternative during the final design phase. These design refinements include:

1. Establishing final dam crest elevations;
2. Finalizing dam configuration, crest width, and keyway into river bed and abutment connections;
3. Determination of optimal weir width, elevation, and configuration with respect to velocity profiles, boat and fish passage, and upstream water surface elevations;
4. Final design features including channel width and slope and pool sizing and depth for boat and fish passage channel;
5. Applicability and extent of bioengineered bank treatments;
6. Selection of the preferred control valve system for proposed intake control;
7. Final extent of flood inundation limits and potential mitigation and protection to existing structures;
8. Final screen sizing, both in terms of surface area and opening size;
9. Final intake piping alignments, appurtenances, existing pump station access and connection to existing suction header piping; and
10. Final geotechnical recommendations for upstream cut off walls.

6.0 Permits and Authorizations

It is anticipated that this project will require the following permits and consultation activities:

- SPA 124 Permit from FWP
- Federal Clean Water Act Section 404 Permit from USACE
- Clean Water Act Section 401 Water Quality Certification from USCOE and DEQ
- Short-term Water Quality Standard for Turbidity (318 Authorization) from DEQ
- Montana Pollutant Discharge Elimination System (MPDES) General Permit for Storm Water Discharges Associated with Construction Activity from DEQ
- MPDES General Permit for Discharges Associated with Construction Dewatering from DEQ
- Montana Land-Use License or Easement on Navigable Waters from DNRC
- Floodplain Development Permit from Silver Bow and Beaverhead County Floodplain Administrators
- National Historic Preservation Act Section 106 Consultation with SHPO
- Demolition Permit from the Butte Historic Preservation Commission (HPC)

7.0 List of Preparers

The members of the interdisciplinary team that aided in the preparation of the Big Hole River Diversion Dam Environmental Assessment are listed below:

Preparer / Reviewer Name & Affiliation	Role
Dan Dennehy Butte-Silver Bow	Project Sponsor
Rick Larson Butte-Silver Bow	Project Sponsor
Marty Hovan Butte-Silver Bow	Project Sponsor
Dick Talley, P.E. DOWL HKM	Project Manager and Lead Engineer
Sarah Nicolai, E.I. DOWL HKM	Environmental Planner
Jay Thom, P.E. DOWL HKM	Senior Water Resources Design Engineer
Kristen Hansen DOWL HKM	Senior NEPA/MEPA Practitioner
Maryellen Tuttell, AICP DOWL HKM	Senior Planner and NEPA/MEPA Practitioner
Maria Shepherd DOWL HKM	Senior Biologist
Gary Elwell, P.E. DOWL HKM	Senior Hydrology and Hydraulics Engineer
Jim Potts, E.I.T. DOWL HKM	Hydrogeologist / Water Rights Specialist
Brian Chevalier, P.E. WHPacific	Senior Water Resources Design Engineer

8.0 Distribution List

Federal Agencies

U.S. Army Corps of Engineers
Helena Regulatory Office
10 West 15th Street, Suite 2200
Helena, MT 59626
Attn: Todd Tillinger, State Program Manager
Vicki Sullivan, Project Manager

U.S. Army Corps of Engineers
Seattle District
CENWS-PM-CP-CJ
PO Box 3755
Seattle, WA 98124-3755
Attn: Lynn Wetzler, Project Manager

U.S. Army Corps of Engineers
Omaha District
1616 Capitol Avenue
Omaha, NE 68102-4901
Attn: Matthew D. Vandenberg,
Environmental Resource Specialist

U.S. Environmental Protection Agency
Region 8 Office
1595 Wynkoop Street
Denver, CO 80202-1129
Attn: Toney Ott, Environmental Scientist

U.S. Department of the Interior
Fish & Wildlife Service
Montana Field Office
585 Shepherd Way
Helena, MT 59601
Attn: R. Mark Wilson, Field Supervisor
Doug Peterson, Fishery Biologist

U.S. Bureau of Land Management
Butte Field Office
106 North Parkmont
Butte, MT 59701
Attn: Richard Hotaling, Field Manager
Renee Johnson, Assistant Field Manager

U.S. Environmental Protection Agency
Region 8, Montana Operations Office
Federal Building, 10 NW 15th Street, Suite 3200
Helena, MT 59626-0096
Attn: Julie DalSoglio, Acting Director
Steve Potts, NEPA Coordinator

State Agencies

MT Dept. of Natural Resources & Conservation
1625 11th Avenue
P.O. Box 201601
Helena, MT 59104-0437
Attn: Mary Sexton, Director
Terry Eccles, Regional Manager
Dana Boruch, Right-of-Way Specialist

Montana Fish, Wildlife & Parks
Region 3 Office
1400 South 19th
Bozeman, MT 59718
Attn: Bruce Rich, Regional Fisheries Manager

Montana Department of Environmental Quality
1520 East 6th Avenue, P. O. Box 200901
Helena, MT 59620-0901
Attn: Judy Hanson, Administrator, Permitting & Compliance Division
Tom Ellerhoff, Administrative Officer
Jeff Ryan, Environmental Science Specialist
Chris Romankiewicz, Compliance Inspector

Montana Fish, Wildlife & Parks
Butte Area Resource Office
1820 Meadowlark Lane
Butte, MT 59701
Attn: Jim Olsen, Fisheries Biologist

Natural Resource Damage Program
65 East Broadway
Butte, MT 59701
Attn: Pat Cunneen, Environmental Science Specialist

Montana Department of Transportation
2701 Prospect Avenue
P.O. Box 201001
Helena, MT 59620-1001
Attn: Jim Lynch, Director
Bryan Miller, Bridge Area Engineer

Montana Environmental Quality Council
Legislative Environmental Policy Office
P. O. Box 201704
Helena, MT 59620-1704
Attn: Todd Everts

Office of the Governor
Montana State Capitol Bldg.
P.O. Box 200801
Helena, MT 59620-0801
Attn: Governor Brian D. Schweitzer

Montana State Library
P.O. Box 201800, 1515 East 6th Avenue
Helena, MT 59620-1800
Attn: James Kammerer, Information Services Manager

Local Agencies

Butte-Silver Bow
Planning Department, Community Development
Room 115, Courthouse
155 W. Granite
Butte, MT 59701
Attn: Steve Hess, Floodplain Administrator
Jim Jarvis, Historic Preservation Officer

Beaverhead County
2 South Pacific St., STE #12
Dillon, MT 59725
Attn: Larry Laknar, Floodplain Administrator
Lori Casey, Senior Planner

Beaverhead County Conservation District
420 Barrett St.
Dillon, MT 59725
Attn: Danette Watson

Butte –Silver Bow Historic Preservation Committee
403 West Quartz
Butte, MT 59701
Attn: Jim Shive, Committee Member

Mile High Conservation District
P.O. Box 890
Whitehall, MT 59759
Attn: Kris Hugulet

9.0 Public and Agency Coordination

Advisory Committee

An Advisory Committee (AC) was developed in order to gain input and address the concerns of interested stakeholders. The AC was comprised of the following members:

Al Lefor, Big Hole River Foundation and adjoining landowner
Tony Schoonen, Skyline Sportsman Association
Pat Bailey, adjoining landowner
Leo Jense, Anaconda Sportsman Club
Jim Hagenbarth, Big Hole Watershed Committee
Mike Bias, Big Hole River Foundation
Steve Parker, Big Hole River Foundation and Montana Tech
Steve Luebeck, George Grant Chapter Trout Unlimited

The first AC Meeting was held on July 22, 2009. The purpose of the meeting was to explain the intent of the committee, discuss the purpose and need for the proposed project, present the proposed project timeline, discuss preliminary project alternatives, and solicit input regarding environmental constraints and project goals. Committee members asked questions regarding the process and project intent, but did not voice any objections to the project.

The second AC Meeting was held on November 9, 2009. This meeting was held to provide an update on the project development activities, a briefing of agency interaction and concerns, and to present the refined design alternatives resulting from the scoping process and input from the public, agencies, and the AC representatives. Each project alternative was discussed in detail at this meeting and AC members provided input as to further refinements and comments from their respective interest groups.

Landowner Coordination

Members of the project team informally met with adjacent landowners at their respective properties and at the project site in order to discuss the proposed project and potential impacts to private property.

An on-site meeting was held with Jack Kambich. Mr. Kambich owns land located immediately downstream of the existing diversion dam, which is serviced by irrigation waters from the ditch that flows through the project area. Mr. Kambich also owns land that could be used as a borrow source for construction materials for the proposed project. The meeting consisted of an on-site review of the dam, an explanation of preliminary project alternatives, a review of the potential borrow source, and a review of the irrigation ditch operations. Mr. Kambich had no objections to any of the project alternatives or the project as a whole.

An on-site meeting was held with Al Lefor. Mr. Lefor owns property adjacent to the project site on the north side of the river and also operates a flyfishing and outfitting company. The purpose of the meeting was to explain and present the project alternatives and to solicit information on boater incidents at the dam, as well as incidents involving high water, ice blockages, and fish passage concerns. Mr. Lefor objected strongly to Alternatives 1 and 2 as they do not provide boat and fish passage. He had no objections to Alternatives 3, 4 or 5.

An on-site meeting was held with Pat Bailey. Mr. Bailey owns all lands adjacent to the project site on the south side of the river both up and downstream of the existing diversion dam. The purpose of the meeting was to explain and present the project alternatives and to seek Mr. Bailey's permission to use a portion of his land for construction staging and materials storage purposes and to obtain access to the site from the south side of the river. Mr. Bailey had no objections to any of the project alternatives presented, but believed that Option 4 may present the best scenario for recreational use and would probably be the most economical solution. Mr. Bailey also stated he would be agreeable to a construction easement on his property for an extended period during project development and construction.

Agency Coordination

Local, state and federal agencies were asked to participate in the EA process in order to foster communication, identify and resolve issues, and provide timely and constructive comments. Scoping letters were sent to regional, state, and federal regulatory agencies as a notification that BSB proposes to replace the Big Hole River diversion dam and intake structure (Appendix H). Through these letters, BSB requested each agency's participation in identifying any concerns that would need to be addressed through the environmental review process. Agency response letters are included in Appendix I.

Agency Coordination Meeting #1

An Agency Coordination Meeting was held in Butte on September 1, 2009. Agencies with jurisdiction, interest, or expertise on issues within the study corridor were invited to attend. The purpose of the meeting was to present and discuss the Purpose and Need and goals of the proposed project, alternatives to be considered in the EA, and preliminary research results. Representatives from BSB, DEQ, DNRC, FWP, NRDP, USACE, EPA, and FWS attended the meeting. Minutes from this meeting are included in Appendix J.

Agency Coordination Meeting #2

A second Agency Coordination Meeting was held in Butte on November 3, 2009 to provide a progress update on the development and analysis of project alternatives and to present the Preliminary Preferred Alternative. Representatives from BSB, DEQ, DNRC, FWP, USACE, EPA, and FWS attended the meeting. The purpose of the meeting was to discuss agency roles and responsibilities and to review the project alternatives. Minutes from this meeting are included in Appendix J.

Coordination with Special Interest Groups

A number of presentations were given to special interest groups and civic organizations over the course of the project, including the Big Hole River Foundation Board (October 2009), Big Hole River Watershed Committee (October 2009), Silver Bow Kiwanis (October 2009), and the Butte Exchange Club (November 2009). Members of the project team explained the proposed project, presented the alternatives under consideration, and provided an overview of the Environmental Assessment process.

Tribal Coordination

In November 2009, scoping letters were sent to the Confederated Salish & Kootenai, Crow, Northern Cheyenne, Chippewa Cree, Blackfeet, Little Shell, Fort Belknap, and Fort Peck Tribal Historic Preservation Offices informing them of the project and requesting their knowledge of or concerns regarding historic sites within the project area (Appendix H). No reply letters have been received to date.

Public Scoping Meeting

An initial public information meeting was held at the Council Chambers located in the Butte-Silver Bow Courthouse on August 27, 2009. The meeting was advertised in the Montana Standard newspaper on August 15, 20, and 27, 2009. The meeting took place from 6:00 p.m. to 8:00 p.m. Approximately 20 people attended the meeting. The meeting format included a formal presentation followed by a question and answer period. The purpose of the meeting was to discuss the Purpose and Need and goals of the project and to present preliminary project alternatives. Following the formal presentation, members of the public commented on a number of aspects of the project including habitat impacts and mitigation; regulatory agency involvement; icing, sediment and debris problems; project costs; vandalism and safety concerns; historic preservation; permitting concerns; and technical questions regarding design of each of the alternatives. No written public comments were received. The newspaper advertisement and a summary of the first public meeting are included in Appendix K.

Public Hearing

Public Hearings were held at the Council Chambers located in the Butte-Silver Bow Courthouse on December 15, 2009 and at the Grange Hall in Divide, MT on December 16, 2009. The meetings were advertised in the Montana Standard newspaper on November 25, December 2, and December 9, 2009 (see Appendix K). The meetings took place from 6:00 p.m. to 9:00 p.m. The meeting format included a formal presentation followed by a question and answer period. Summary to be included following the close of the public and agency comment period.